

EPA Superfund
Record of Decision:

EAGLE MINE
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MINTURN/REDCLIFF, CO
03/29/1993

EAGLE MINE SITE

OPERABLE UNIT 1

DECLARATION FOR THE RECORD OF DECISION

EAGLE MINE SITE - OPERABLE UNIT 1

Declaration for the Record of Decision

Site Name and Location

Eagle Mine Site, Operable Unit 1

Eagle County, Colorado

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Eagle Mine Site, Operable Unit 1 (OU-1) ("Site"), located in Eagle County, Colorado, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, the National Contingency Plan (NCP). This decision document explains the basis and purpose of the selected remedy for the Site. The remedial action described in this document is "in addition to" the State of Colorado (State) clean up action which began in 1988 under a Natural Resource Damages (NRD) suit filed under CERCLA. The information supporting the State's decision under the NRD suit is contained in a separate Administrative Record.

Assessment of the Site

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial danger to public health, welfare, or the environment.

Description of the Remedy

This Operable Unit, one of two designated for the Site, addresses the principal sources of mine waste pollution that are impacting the Eagle River and certain ground water resources. The purpose of this Operable Unit (OU-1) is to control the transport of toxic metals originating from various sources to the Eagle River and to Site ground waters. The identified sources include the Eagle Mine, the Roaster Pile area, the Waste Rock Piles, Rex Flats, the Old Tailings Pile (OTP), the Consolidated Tailings Pile (CTP) and the Maloit Park Wetlands.

The environmental receptors of concern are the fresh-water biota, particularly the Eagle River aquatic life. Human health concerns include potential impacts and possible re-entrained soils contamination from the CTP to children and employees attending the Minturn Middle School and to full-time residents who live adjacent to the school from wind-blown particulate matter from the Consolidated Tailings Pile (CTP). There are also human health concerns related to potential future contamination of the Town of Minturn drinking water wells.

The major components of the selected remedy include:

- Installation of a system to collect additional mine seepage along Rock Creek
- Diversion of Rock Creek upgradient of contaminated mine seepage
- Expediting revegetation in the area of Roaster Pile 1 and associated drainage, and monitoring of seep water quality below the Roaster Pile 1 area
- Surface water run-off and ground water monitoring at the Waste Rock Piles, leachability tests on the waste rock, with evaluation of the data for possible future action
- Development of an inspection and maintenance plan to ensure the long-term integrity of structures and facilities associated with the Eagle Mine Site
- Implementation of use restrictions for ground water at the Rex Flats and OTP and accelerated revegetation at Rex Flats
- Rapidly complete the cap on the CTP, drain and cap the historic pond, extract and treat leachate/ground water from the CTP extraction trenches, enhance CTP extraction trenches, construct a new up-gradient ground water diversion structure and relocate the Town of Minturn drinking water wells
- Continue the treatment of contaminated mine seepage and leachate/ground water from the CTP at the Water Treatment Plant (WTP) until Site cleanup goals can be met without such treatment, dewater the treatment sludge, and dispose of the dewatered sludge in on-site lined cells on the CTP

- Remove the contaminated soils and sediments from the Maloit Park Wetlands, control seepage from the CTP, and rapidly add topsoil and revegetate
- Conduct regular monitoring of surface water, groundwater, mine pool, and biota at key locations on the Site and downstream of the Site to determine progress toward cleanup goals

The components noted above represent the current selected remedy. EPA recognizes that there is ongoing research into alternate remedies and encourages the responsible party to continue this research.

A separate Operable Unit, OU-2, has been established to evaluate additional potential human health risks at the Eagle Mine Site. These concerns relate to: the potential windblown metals deposition in the south end of Minturn and in the Minturn Middle School area; the potential future risk from metals in soils and waste rock in the Town of Gilman and; the potential contamination of private drinking water wells in the Minturn area.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. A substantial portion of the metals loading will be removed by collection and treatment of contaminated surface and ground water. The remainder of the metals loading will be controlled through capping and revegetation.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review of the remediation will be conducted five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

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EAGLE MINE, OPERABLE UNIT 1

Decision Summary for the Record of Decision

I. SITE NAME, LOCATION, AND DESCRIPTION

The Eagle Mine Site is a large abandoned mining and milling facility located along the banks of the Eagle River near Minturn, Colorado (see Figure 1). The boundaries of the Site are defined by the areas of past mining activity between the towns of Red Cliff and Minturn. There are associated impacts from Site contaminants which extend downstream in the Eagle River, possibly as far as Gypsum, Colorado. The 235-acre Eagle Mine Site, referred to in this document as the "Site", includes the Eagle Mine Workings, the town of Gilman, the mine tailings pond areas, Rex Flats, Rock Creek Canyon, and waste rock and roaster pile areas (see Figure 2). The Site is bordered on the south and west by the White River National Forest which includes the Holy Cross Wilderness Area. Access to the wilderness area runs through the Site and next to the historic location of the Old Tailings Pile (OTP).

The Eagle River is the major surface water resource affected by the metals contamination from the Site. The headwaters of the Eagle River originate about 15 miles above Red Cliff. The Eagle River flows north-northwest through the Site to the town of Avon where it turns generally westward until it joins the Colorado River at Dotsero. The Eagle Mine workings were developed in the lower levels of Battle Mountain to the east of the Eagle River and just south of Rock Creek. Several wetland and former wetland areas border the Eagle River between Red Cliff and Minturn. Rex Flats, a low lying area which was once a wetland, is located on the east side of the Eagle River across from the OTP area about three miles north of the mine. The OTP area was a hay meadow prior to the advent of mining operations. Another tailings disposal unit, the New Tailings Pile is called the Consolidated Tailing Pile (CTP) in this ROD. The CTP is located about a mile north of the OTP just west of the Eagle River and south of Cross Creek. The Maloit Park Wetland along Cross Creek has been affected by surface water and ground water flowing from this pile.

The Eagle River is used as a water supply and for recreation (i.e., rafting and kayaking). Fishing also occurs on the Eagle River from the headwaters to the Colorado River. There are numerous diversions from the Eagle River for municipal supply, stock watering, and irrigation downstream from the confluence with Gore Creek. The closest residence to the Site is 1,000 feet to the northeast along Highway 24. Minturn, the closest population center, with 1,500 people, has filter ponds and municipal wells located northwest of the CTP and across Cross Creek. Minturn draws its public water supply both from area wells and from Cross Creek.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Description and History of the Site

The Eagle Mine Superfund Site is located near Minturn in Eagle County, Colorado. The Eagle Mine area ore deposits, a large body of zinc and lead ores, along with some precious metals, were first mined in the 1870's. Early in the 1900's, the New Jersey Zinc Company consolidated a number of these workings and operated them as the Eagle Mine until 1966 at which time the company was merged with Gulf + Western, Inc.

The Eagle Mine workings are underground. At the turn of this century, ores were processed by "roasting." Residues from this process were left in five "roaster piles," three on the west side of the Eagle River and two on the east side. Later, a mill was constructed underground to process ores. Mill tailings were slurried down valley and deposited at the OTP. Tailings were also deposited in the Rex Flats area and some were left under the slurry line, probably through accidental spillage. When the OTP area was "full" the slurry line was extended further to the north and the New Tailings Pile, now called the Consolidated Tailings Pile (CTP), was created. Tailings and polluted water ran off the New Tailings Pile depositing metals in adjacent Maloit Park Wetlands. Ground water in the Rex Flats, Old and New Tailings Pile, and Maloit Park Wetlands area became polluted. Impacts to the Eagle River from Site contaminants have been noted downstream, possibly as far as Gypsum, Colorado.

Gulf + Western, which has since changed its name to Paramount Communications, Inc., operated the Eagle Mine until 1979. In 1983, Gulf + Western sold the property to Mr. Glenn Miller. Mr. Miller immediately sold portions of the surface property to the Battle Mountain Corporation and also attempted to operate the mine for a short period of time. The mining operation was abandoned in 1984. Battle Mountain Corporation obtained a loan from a Texas savings and loan and later defaulted. The savings and loan has since become insolvent and has been taken over by the Federal Deposit Insurance Corporation (FDIC). The FDIC has not yet foreclosed on the property and holds the notes to the Battle Mountain property.

In 1983, the State of Colorado filed a complaint against Gulf + Western and the New Jersey Zinc Company for natural resource damages under the Superfund statute. In 1986, the State amended their complaint to seek injunctive relief against Gulf + Western. In 1986, the EPA placed the Eagle Mine Site on the National Priority List, making it a designated Superfund Site. EPA and the State entered into a Memorandum of Agreement (MOA) in 1986 which designated the State as "lead" agency for the Site cleanup.

The State and Paramount resolved their lawsuit in 1988 when the two parties entered into a Consent Decree/Remedial Action Plan (RAP). This agreement included the following major provisions 1) plugging the mine adits and grouting fracture zones to flood the mine workings to stop the generation of acid mine drainage; 2) removal of roaster piles; removal of tailings from Rex Flats, the pipeline corridor, the toes of CTP, and the Old Tailings Pile, and removal of contaminated Maloit Park wetland soils with consolidation of those materials at the CTP; 3) capping and temporary ground water pumping at the CTP, and; 4) setting compliance objectives and long-term monitoring of surface water, ground water, mine water, vegetation, soils, CTP settlement and erosion. Compliance standards were set for dissolved zinc concentrations in the Eagle River, for soils cleanup (lead and pH standards), and for revegetation criteria.

The RAP also required run-on diversion ditches at the waste rock piles; site-wide treatment of underlying soils for pH adjustment, removal or isolation of soil with high lead levels and revegetation of disturbed areas. Temporary surface runoff and run-on control at Rex Flats, OTP, and CTP were required as were an upgradient ground water diversion ditch and two ground water extraction trenches at the CTP, removal of historic pond on top of CTP and construction of lined surge pond at CTP. Other RAP provisions included diversion of lower Rock Creek, disposal of contaminated water at the site, regrading and stabilizing the CTP, dust control during construction, installing an Eagle River gauging station and connecting the Pierson house to the municipal water supply. The RAP included a Construction QA/QC plan, construction element approvals by State inspectors, final construction reports and a State inspection and certification program.

EPA reviewed the Consent Decree/Remedial Action Plan and found it generally "environmentally acceptable," but expressed reservations about its ultimate success. EPA believed this success would have to be demonstrated by continued monitoring of Site conditions.

B. Status of State Cleanup

Although significant progress has been made at the Site, concerns about the effectiveness of the cleanup and evidence of difficulties in its accomplishment appeared in late 1989 and early 1990 when metals concentrations in the Eagle River were extremely high. In May 1990 the State and Paramount amended the Remedial Action Plan and added: a chemical water treatment plant, a second lined surge pond, a mine seepage collection system, expanded ground/surface water monitoring, annual contaminant loading report, temporary sludge disposal at CTP, Rock Creek grouting and evaluation, and OTP ground water reduction. Operation of this treatment plant which presently treats mine seep water and ground water and surface water from the CTP has improved the water quality of the Eagle River. The State continues to pursue additional cleanup measures under its Consent Decree including improvement of mine seep collection, removal of additional roaster material, and revegetation of disturbed areas.

One notable aspect of the RAP relates to how Paramount was to achieve compliance with the water quality goals set in the Eagle River. The Eagle River water quality goals were set at 150 ug/l dissolved Zn below the mine and 250 ug/l dissolved Zn immediately above the confluence with Cross Creek. The goals were to be met in September of an average flow year and were to be averaged over 30 days. In contrast, EPA believes that the critical time of year for meeting in-stream standards that will lead to re-establishing the aquatic community including a viable

fishery may be during the low-flow period in late winter.

Another aspect of the RAP that EPA has noted is the absence of consideration of possible ground water problems in the CTP/Maloit Park Wetlands area. Minturn operates municipal wells that draw water from an aquifer that could potentially be impacted by leachate from the CTP. This problem has been alleviated by a recent agreement whereby Paramount will provide Minturn with new drinking water wells which are currently under development. In addition, because of the upstream location of the surface water compliance points adopted in the RAP, the full impact of the contaminated CTP Maloit Park ground water on Eagle River water quality is not reflected in the data.

On April 4, 1991, the Water Management Division at EPA issued a Notice of Violation (NOV) to the CDH for alleged violations of Section 301 of the Clean Water Act by Paramount. These alleged violations included discharges from various mine seeps and discharge from the Roaster Pile area. The Water Division action was coordinated with the Superfund program with EPA viewing the NOV as an opportunity to compel additional clean-up actions at the Site.

The Colorado Department of Health responded to the NOV on November 1, 1991. In lieu of further NOV action, CDH and Paramount agreed that Paramount would do additional work in the Roaster Pile area, collect additional mine seepage, and explore the possibility of collection of subsurface mine seepage in the colluvial material in Rock Creek. CDH also was to pursue Paramount for payment of fines for several of the alleged violations. EPA accepted this proposal.

C. EPA's Feasibility Study Addendum

In the fall of 1990, EPA announced it would conduct a Feasibility Study Addendum (FSA). The purpose of the FSA was to help solve Site problems using Federal authorities. It was called an "Addendum" because it was being done "in addition" to, and consistent with, the large effort already underway by the State of Colorado. The FSA was released to the public on June 17, 1992, and serves as the technical and analytical basis for the Proposed Plan, and this ROD.

D. EPA's Proposed Plan: Projected Future Remedial Efforts

The Proposed Plan for OU1 was released to the public on June 30, 1992. The public comment period was first extended to August 30, 1992 and again to September 14, 1992. The extension was specifically to allow complete comments on the water quality standards.

EPA has recently concluded that additional risk assessment must be conducted at the Site due to possible wind-blown deposition of metals into populated areas of Minturn and the nearby Minturn Middle School. A screening of soils was initiated in September 1992. In order to expedite the ROD process, this additional soils work has been separated from the remainder of the Site and classified as Operable Unit 2. If no significant risk is found, EPA will document a "no action decision" on OU-2. If significant risk is found to exist, OU-2 will be the subject of a complete RI/FS, Proposed Plan, and a Record of Decision.

E. Potentially Responsible Party (PRP) Response Actions

In 1981 Gulf + Western personnel entered the mine and drained fluid containing polychlorinated biphenyls (PCBs) out of three transformers located in an abandoned portion of the mine. These three transformers were drained and flushed but an estimated 28 lbs of PCB remained. EPA has determined that there is very low risk associated with the limited amount of PCBs remaining in the mine. In 1984 the Colorado Public Service Company notified EPA that it planned to shut off electric power to the mine due to unpaid bills. If power was shut off the mine would flood and a quantity of other electrical equipment containing PCBs would be under water. Accordingly, EPA conducted an Emergency Response Action in June 1984 and removed all but the three previously noted transformers from the mine.

In 1991, EPA became aware that hazardous substances may have been abandoned at the Eagle Mine Site, including the company town of Gilman. A confused ownership situation and apparent lack of day-to-day control of access to the property heightened EPA concern.

Accordingly, EPA decided to conduct a Site inspection and assessment of the entire property. This decision was discussed with personnel from the Colorado Department of Health, who decided

to participate in the inspection and possible removal.

EPA and CDH representatives conducted the inspection over several days beginning on October 8, 1991. A quantity of hazardous substances were found including explosives, laboratory chemicals, PCBs, and one radioactive vial.

Cleanup negotiations were concluded on November 21, 1991, when Paramount and the State signed an amendment to the RAP that allowed Paramount to conduct a removal action. Paramount began the removal action immediately after the signing of the agreement. Although various problems arose that kept Paramount from meeting the target date of June 1992, the removal was essentially completed by September 1, 1992.

F. Potentially Responsible Parties

1. Paramount Communication Inc.

A subsidiary of the New Jersey Zinc Company (NJZ), the Empire Zinc Company, operated the Site from 1915 until 1938. NJZ operated the mine from 1938 until it merged with Gulf + Western Industries, Inc on February 25, 1966. NJZ conducted hard rock mining activities at the Site that resulted in the creation of acid mine drainage and waste rock piles that contribute to contamination at the Site. Paramount Communications Inc, formerly known as Gulf + Western Industries, Inc. is the successor in interest to NJZ. Gulf + Western changed its name to Paramount Communications Inc. on June 5, 1989. Gulf + Western sold the Eagle Mine Site on September 1, 1983. Paramount is potentially liable under CERCLA as a past operator of the facility at the time of disposal.

2. Glenn T. Miller doing business as Miller Enterprises

Glenn T. Miller, doing business as Miller Enterprises (Miller), acquired all of the Site property formerly owned and operated by NJZ/Gulf + Western Industries Inc. on September 1, 1983. On the same day, Miller sold approximately 1,400 acres of the 6,500 acres obtained from Gulf + Western Industries Inc. to Battle Mountain Corporation. Miller briefly operated the facility but almost immediately defaulted on the purchase agreement with Gulf + Western. Furthermore, Miller did not pay taxes on the property and consequently tax lien sales were conducted in 1984 and 1985. Applications for treasurer's deeds are currently pending. Treasurers deeds were scheduled to be issued for a portion of Miller's property on August 24, 1992 and October 26, 1992. Other parcels which were sold at tax lien sales have not been scheduled for issuance of treasurer's deeds. Glenn Miller is potentially liable under CERCLA as a part owner and operator of the facility.

3. Battle Mountain Corporation

On September 1, 1983, Battle Mountain Corporation (BMC) acquired the surface rights to approximately 1400 acres of property within the Site boundaries. Situated on a portion of the BMC property were tailings piles which are the subject of remedial action at the Site.

BMC's acquisition of the subject property was secured by a Deed of Trust to the State Savings and Loan of Lubbock, Texas. As a result of a series of transactions, this interest in the property was ultimately assumed by the Federal Deposit Insurance Corporation (FDIC) when it took over the insolvent State Savings and Loan.

BMC was incorporated in Colorado on August 9, 1983. BMC is currently listed as a "suspended" corporation by the Colorado Secretary of State. BMC is potentially liable under CERCLA Section 107(a)(1) as a current owner of a portion of the facility.

G. Past Issuance of Notice Letters

EPA has not issued any general or special notice letters.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Feasibility Study Addendum (FSA) for OU-1 of the Eagle Mine Site was released to the public for comment on June 17, 1992. The Proposed Plan for OU-1 was released to the public for comment on June 30, 1992. These two documents were made available to the public in the Administrative Record maintained at the Town Manager's Office, Minturn Municipal Building, Minturn, Colorado, and at the EPA Region VIII Superfund Records Center in Denver, Colorado. Both these documents were also given wide public distribution.

The notice of availability for the FSA, the Proposed Plan, and other documents in the Administrative Record was published in the Vail Daily and Eagle Valley Enterprise on July 2, 1992. Other notices appeared in the Vail Trail on July 3, 1992, and ABC Times on July 8, 1992. The initial public comment period was from June 30, 1992, to July 30, 1992.

Upon timely request, the public comment period was first extended for 30 days to August 30, 1992. A second extension until September 14, 1992 was made specifically to allow further comment on the issue of water quality goals and standards.

A public meeting was held in Minturn, Colorado, on July 22, 1992, to allow the public an opportunity to provide comments on the Proposed Plan and to ask representatives of EPA about the Site and about the remedial alternatives under consideration. A response to substantive comments received during the public comment period is included in the Responsiveness Summary, which is part of this Record of Decision.

This decision document presents the selected remedial action for OU-1 at the Eagle Mine Site, in Eagle County, Colorado, chosen in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act with the National Contingency Plan. The decision for this Site is based on the Administrative Record.

IV. SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

The remediation measures described in this Record of Decision are additions and modifications to the substantial clean up measures agreed to, and implemented by Paramount Communications, under the 1988 Consent Decree/(RAP). OU1, developed under EPA's Feasibility Study Addendum analysis of Site problems and alternative solutions, is one of two operable units within this Site.

OU-1 encompasses the major environmental problems at the Site and public health concerns as related to the Town of Minturn's municipal drinking water supply, to the students and employees at the Minturn Middle School and to Maloit Park residents. A final determination on risk, and clean up measures if warranted, related to the Minturn Middle School and Maloit Park will not be made until the completion of additional risk assessment activities under OU-2, which has been termed "Soils." OU-1 focuses on the transport of metals to the Eagle River from Eagle Mine seepage, the Roaster Piles, the Waste Rock Piles in the Gilman/Belden area, Rex Flats, the Old Tailings Pile, the CTP, and Maloit Park.

Based on data for the months of November through April in 1990, 1991 and 1992, EPA has determined that about 40 to 60% of the increase in metals loadings in the Eagle River at the Site is from Eagle Mine seepage; about 10 to 30% is from non-point sources in the Belden area; approximately 2-3% is from the Roaster Pile area; and about 15 to 40% of the increase in load is from the CTP area, primarily by ground water originating from the latter. The Rex Flats and OTP areas contribute an unquantified load during snow-melt and storm events. The relative contribution of metals loading for each major source area is variable depending on seasonal impacts, storm events, snowmelt, and the inherent imprecision in measurement of stream flow volume.

OU-2 encompasses the soils in the Minturn Middle school area and in an approximate 2 square mile area in the south end of Minturn; the surface soils and waste rock piles in the Town of Gilman area, and private drinking water wells possibly being used in the Minturn area. OU-2 was created to address human health risk concerns related to potential wind-blown deposition of metals in populated areas from the Consolidated Tailings Pile, from potential well contamination near the Site, and from potentially elevated metals concentrations in soils and in waste rock located in the town of Gilman which may be reinhabited in the future. OU-2 will result in either a No Action or a complete ROD as per OU-1, depending on the results of the risk analysis

currently underway.

V. SUMMARY OF SITE CHARACTERISTICS

Over the last 100 years, zinc mining resulted in the deposition of about 8 to 10 million tons of mine wastes and mill tailings along the Eagle River. Degradation of surface water and ground water is believed to be caused by acid mine drainage and seepage containing toxic metals which have been transported into surrounding media.

In the original Remedial Investigation (RI) done for the State of Colorado by Engineering Science in 1985, the media and associated contaminants of potential concern (CPCs) at the Site were identified. Based on the RI results, the original five major sources of contamination were defined as follows:

1. Tailings Ponds (piles)
2. Roaster Piles
3. Mine Water (seepage)
4. Waste Piles (waste rock)
5. Pipeline Corridor (Rex Flats)

The remedial actions which have been initiated and the flooding of the old mine works have caused a substantial change in the original nature and extent of contamination. Therefore, the original five sources of contamination at the Site have been redefined as follows:

1. Eagle Mine Seepage
2. Waste Rock Piles/Belden Non-Point Sources
3. Roaster Pile Area
4. Rex Flats/Old Tailings Pile Areas
5. Consolidated Tailings Pile
6. Maloit Park Wetlands

Further, for consistency and convenience, the Water Treatment Plant will be presented as the seventh area at the Site.

This section describes the sources of contamination, the estimated quantity of contaminants and the uncertainties associated with these estimates. A brief description of the nature and extent of contamination for each source area is presented in the following sections.

A. Eagle River

As stated earlier, the quality of the water in the Eagle River has been degraded by the historic waste disposal activities, by the closing of Eagle Mine and by some of the remedial activities conducted at the Site.

The Eagle River is generally a gaining stream across the Site with the exception of the segment associated with Rex Flats/OTP, which is generally a losing reach. Streamflow in the Eagle River at the Site is characterized by high flow rates during late spring and summer runoff and a relatively stable baseflow period during the fall, winter and early spring. In 1990, measurements taken at the USGS station at the Highway 24 bridge located in the middle of the Site, show a range in flow from 13 cubic feet per second (cfs) on January 4 to 881 cfs on June 5. The Eagle River low-flows calculated in the Water Treatment Plant discharge permit are presented in Table V-1; these are average seasonal low-flow rates based upon statistical analysis of flow rate measurements collected at the Site over a number of years. The Eagle River water quality for the November through April base-flow period are presented in Table V-2.

As indicated in Table V-2, water quality in early 1990 was severely impacted by remedial construction activities which were being implemented at the various source areas at the Site; Site surface water quality during this period was the worst since regular sampling was initiated at the Site. Surface water quality is generally improving, although monthly sampling does not indicate a completely improving trend and the final water quality is not predictable. Water quality is now approaching the quality in 1985, prior to starting the cleanup. Metals concentrations are still significantly above the levels set forth in the final remediation goals.

Table V-1
Eagle River Low-Flows

Type	Flow
Acute (1E3)[1]	13.0 cfs - November through April
	40.0 cfs - May through July
	28.0 cfs - August through October
Chronic (3E30)[2]	16.0 cfs - November through April
	35.0 cfs - May through July
	27.0 cfs - August through October

<Footnotes>

1 Acute: the acute low flow values represent the empirically based 1-day low flow with an average 1-in-3-year recurrence interval

2 Chronic: the chronic low flow values represent the empirically based average 30-day low flow with an average 1-in-3-year recurrence interval.

</footnotes>

Table V-2
Eagle River Water Quality[1]
November - April

DISSOLVED ZINC (MG/L)

MONTH	YEAR		
	89 - 90	90 - 91	91 - 92
November	NA	1.2000	1.3000
December	2.9400	1.5500	1.7700
January	3.6400	1.9000	1.7000
February	NA	2.7000	1.6000
March	3.6500	2.0400	1.3900
April	NA	2.0000	0.940

1 Water quality data for samples collected at Station E-13B below CTP. Data from Dames & Moore, Site quarterly and annual reports.

Another issue of concern is the seasonal pattern of metals concentrations in the Eagle River. Metals concentrations are generally most elevated during the winter and early spring, with the highest concentrations occurring between mid-February and early April. This is a critical period because the fry of certain species of trout emerge during these months. The fry is the life-stage that is most sensitive to metals concentrations.

B. Eagle Mine Seepage

Water retained in the flooded mine works percolates through fractures in the surrounding rock mass and emanates at several locations as surface and subsurface seeps. Seeps occur from the mine near Belden and along Rock Creek. Most of the surface seeps are being collected in both areas; subsurface seepage is indicated to occur predominantly along Rock Creek. The current zinc concentrations in selected Rock Creek surface seeps range from 60 to 100 milligrams per liter (mg/l). Uncollected surface seeps near Rock Creek, surface flow in Rock Creek and associated subsurface flows represent the principal source of metals loading to the Eagle River, contributing from 40% to 60% of the total loading during the November to April baseflow period. Estimates for the baseflow period of 1991 place the loading from Rock Creek seeps between 35 to 130 pounds per day (lbs/day) of zinc.

C. Waste Rock Piles/Belden Non-Point Sources

Previous investigations identified 12 piles covering an area of approximately 93 acres with a total volume of approximately 1,500,000 cubic yards. The waste rock contains elevated levels of metals which could potentially be released during snowmelt and rainstorms. Additionally, during late winter and very early spring the data show significant non-point loading to the Eagle River in the Belden area, approximately 25% of the total Site increase. Nonpoint source load for that segment of the Eagle River ranged from 13 to 191 lbs/day with an average of 56 lbs/day for the period from 11/90 to 4/91. Eagle River dissolved zinc concentrations as measured at Station E-5 below Belden ranged from 0.320 up to 1.3 mg/l during the same period.

D. Roaster Piles

Originally five piles of waste materials from the ore roasting plant were located in the Belden area. These roaster piles have been removed from their original locations and transported to the CTP. Residual quantities of waste material still remain in some of the areas. Revegetation efforts have been undertaken at several of the roaster pile areas.

During 1991, the tributary which drains the RP-1 area (Figure 2), flowed at a rate of 19 to 22 gallons per minute (gpm) during the November to April baseflow period, and up to 133 gpm during runoff. Zinc concentrations in surface water draining from the Roaster Piles varied from 29 mg/l to 43 mg/l during baseflow and ranged up to 76.2 mg/l during June. Zinc loading from the Roaster Piles to the Eagle River varies from 7 to 30 lbs/day in the August to October period to about 45 lbs/day during runoff. Thus, the tributary which drains the Roaster Piles contributes 2-3% of the total increase in load in the Belden segment of the Eagle River.

E. Rex Flats/Old Tailings Pile Areas

As a result of mine operations approximately one million tons of tailings were deposited in the Old Tailings Pile (OTP) and approximately 150,000 tons of tailings were deposited at Rex Flats. These tailings have been removed and placed in the Consolidated Tailings Pile (CTP). Revegetation efforts have been undertaken at both areas.

The ground water which underlies the OTP area is contaminated with heavy metals. The OTP occupies approximately 40 acres, and depth to bedrock is about 40 feet. Assuming a porosity of 25% there is about 400 acre-feet of contaminated ground water underlying the area. This estimate is uncertain due to lack of information concerning the configuration of the alluvial/bedrock structure. Testing performed in wells completed in the OTP indicated that the formation underlying the OTP has very low transmissivity.

The ground water which underlies the Rex Flats area is contaminated with heavy metals. The Rex Flats area occupies approximately 20 acres and depth to bedrock is about 40 feet. Assuming a porosity of 25% there is about 200 acre-feet of contaminated ground water underlying the area. This estimate is uncertain due to lack of information concerning the configuration of the

alluvial/bedrock structure.

Analysis of the metals load upstream and downstream of Rex Flats/OTP indicates that the area generally does not function as a source of metals transport sufficient to impact surface water quality. For each sampling event conducted from November 1990 through April of 1991, metals load through this reach decreased. It is possible that during storm events or periods of rapid snow melt that this area still contributes a net positive increase in load.

F. Consolidated Tailings Pile

The CTP covers about 69 acres. Approximately 30 acres (40%) of the pile have been covered with a low permeability cap. A historic pond on top of the pile creates hydraulic head which contributes to the drive causing metals-laden ground water from the pile to flow toward the east and northeast. Recent water quality data collected in the Eagle River indicate that metals loading from the CTP is variable, contributing from about 15 to 40% of the total during the November to April time period.

G. Maloit Park Wetlands

The Maloit Park Wetlands covers approximately 27 acres and lies immediately north of the CTP and northeast of Minturn Middle School. Portions of the wetlands are contaminated with visible tailings and some wetland soils contain metals at concentrations high enough to negatively impact plant growth. The tailings and contaminated soil range in depth from 1 to 2 feet and cover an area of approximately 7 acres. It is estimated that there is a total of 15,800 cubic yards of tailings and contaminated sediments in the wetland.

WTP

In addition to the source areas described above, the Water Treatment Plant is also of interest in regards to Eagle River contamination/cleanup. The water treatment plant uses lime and soda ash to precipitate metal ions from the contaminated site water. This process produces treated water which is released to the Eagle River and sludge which is currently stored on top of the CTP in the historic pond. The wet sludge disposal practice currently employed prevents the capping of the pile from being completed. Water from the sludge maintains the hydraulic head at the historic pond.

The treated water which is released to the Eagle River is sampled and analyzed on a routine basis to verify that metals levels and pH are in compliance with the permit conditions. (The Permit was issued by Colorado Water Quality Control Division). The plant produces approximately 120 to 150 cubic yards of sludge per day. This sludge contains about six to eight percent solids with the remainder being water. Pilot studies have been conducted on the sludge and show that the sludge can be dewatered by filtration to produce a filter cake which contains approximately 50% solids by weight. This cake occupies about one-third of the volume of the wet sludge. The cake will not give up free liquids.

VI. SUMMARY OF SITE RISKS

OU-1 of the Eagle Mine Site includes surface water, ground water, and on-site tailings material. No baseline risk assessment has been prepared that comprehensively evaluates all potential human health and environmental risks. However, there have been a number of studies conducted that, collectively, assess the major potential exposure pathways for these media. After full review of these documents, EPA has determined that these studies provide all the information and analysis that would be necessary in a baseline risk assessment. Section 3.0 of the Feasibility Study Addendum summarizes the key aspects of these studies. Below is a summary of the findings of these studies as related to this operable unit. The discussion includes the following sections: Source of Contaminants and Chemicals of Concern, Human Health Risks, and Environmental Risks.

A. Sources of Contaminants of Concern

Sources of Contamination The main sources of contamination for this operable unit include: the residual waste material at the Roaster Pile Area, the OTP, the Rex Flats Area, and the CTP; waste rock in the Belden Area and along Rock Creek; and surface and subsurface seepage from the Eagle Mine. These sources have contributed to contamination of surface waters (primarily the

Eagle River) and ground water. The tailings material and waste rock may have been a source of airborne contaminants in the past.

Contaminants of Concern The main contaminants of concern (COCs) associated with the above noted sources are arsenic, cadmium, copper, lead, and zinc.

B. Human Health Risks

As discussed above the main contaminated media at the Site are surface soils, ground water, and surface water. A potential exposure pathway of contamination is human consumption of trout from the Eagle River, which will be discussed in the subsection on surface water. Airborne metals have originated from surface materials and this will be discussed in the surface soil section. The potential for humans to be exposed to these sources of contamination is discussed below along with estimates of potential risk.

Surface Soils: Implementation of the Remedial Action Plan (RAP) has resulted in the removal of the tailings material from Roaster Piles 1-5, Rex Flats, and the OTP. This material has been moved to the CTP, which is being capped and revegetated. The RAP goal is to remove mine waste material from the tailings areas and to reduce residual lead levels to below 1,000 ppm lead in surface soils by removal or isolation. This goal is assumed to be protective of human health for potential future on-site exposures to surface soils. Potential exposure to airborne contaminants is expected to be minimal because the Site is being revegetated.

Ground Water: There are no current users of contaminated ground water at the Site. Although the Town of Minturn has two drinking water supply wells located in the aquifer that extends under the CTP, regular sampling and analysis of this well water indicates that it satisfies federal drinking water standards.

Surface Water: The only surface water use from the Eagle River for drinking water is in the Avon area. The water treatment plant operated in Avon by the Upper Eagle Valley Water and Sanitation District has been inspected by the EPA and was found to provide residents a safe water supply that complies with State and Federal drinking water standards.

It is possible that residents or tourists in the area could consume trout caught in the Eagle River. Chemicals of concern from the surface water could bioaccumulate in trout tissue. The Colorado Department of Health (CDH 1992) evaluated the risks from this potential exposure pathway for arsenic, cadmium, lead, mercury, and selenium. The study concluded that no significant increase in cancer risk was expected and noncarcinogenic health effects were not expected as a result of consumption of fish from the Eagle River.

Numerical human risk values calculated for the Site are summarized in Tables 1 through 3. As a point of comparison, EPA considers that excess lifetime cancer risks greater than 1×10^{-4} (that is, one excess case of cancer per 10,000 people) are outside the acceptable range. Note that the excess lifetime cancer risks calculated for the Site were at a minimum, 20 times lower. Similarly, EPA has determined that non-cancer risks approaching a Hazard Index of "1" are unacceptable.

C. Environmental Risks

This section summarizes the potential exposures and risks to aquatic organisms and terrestrial wildlife associated with the sources of contamination discussed in previous sections.

Aquatic Receptors: The main environmental concern at the Eagle Mine Site is the potential for adverse effects to aquatic organisms in the Eagle River. The Colorado Division of Wildlife conducted studies on the Eagle River fishery in 1990, 1991 and 1992 in the river. These studies are the best available information on the status of potential aquatic receptors. The DOW collected fish, aquatic invertebrates, and water quality data in April and September of 1990 in the Eagle River from Redcliff to Arrowhead; and collected fish and water quality data in April 1991 and 1992. The conclusions of these assessments state that heavy metal concentrations (cadmium, copper, and zinc) in the Eagle River from Belden to Minturn are above levels that are acutely and/or chronically toxic to some trout species. In addition, the fish and aquatic macroinvertebrate communities are severely reduced in this reach of the Eagle River. In 1992, cadmium exceeded the Colorado Water Quality Standard (CWQS) for the Eagle River at DOW sampling

stations from Belden to Minturn. Copper was elevated in 1990 but dropped below CWQS in 1991 and 1992. Zinc concentrations were greater than up to 4 times the CWQS. Zinc also exceeded the DOW criteria for acclimated brown trout by up to approximately 6 times. Total zinc concentrations were higher in April 1991 and 1992 than they were in April 1990. The chronic CWQS are listed in Table VII-B.

Terrestrial Wildlife: For wildlife, potential exposures to COCs in surface soils are assumed to be eliminated by the removal of tailings material from the source areas described previously. Thus, no significant exposures to surface soils are expected to occur in the future.

There are no known ground water exposure pathways for wildlife in the area. Wildlife could be exposed to contaminants in surface water if the river water is used by them as a source of drinking water. Wildlife that consume fish could be exposed to contaminants that may accumulate in fish tissues. This pathway is currently limited because of the low bioaccumulation potential of the COCs and the low fish biomass in the river.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. DESCRIPTION OF ALTERNATIVES

The Eagle Mine Site is a complex, multifaceted site. A vast array of data and technical and regulatory analysis has been developed in key documents which have preceded this decision. This Record of Decision cannot provide the level of detail offered in those earlier documents. For that reason a list of the documents employed in the decision-making has been provided in the Appendix following the Responsiveness Summary. Given the complexity of the Site, the summary of the description of alternatives provided below may warrant referral to those documents.

A. Development of Remedial Action Objectives and Goals

Prior to developing the alternatives, remedial action objectives and numerical cleanup goals were framed consistent with 40 CFR 300.430(e)(2)(i). The objectives and numerical goals were framed in consideration of the Site characteristics which have resulted from the continuing remedial activities, the results of the risk assessments performed at the Site, and the results of evaluations of legal standards and requirements which are either applicable or relevant and appropriate to the remediation (ARAR). In addition to ARARs, other information, known as "to be considered" (TBCs), which proved useful to establishing Site objectives and goals were considered and are summarized below.

CERCLA, as amended by Section 121(d) of SARA requires that remedial actions attain those standards which are ARAR to the Site. The universe of laws, standards, regulations, and criteria initially screened as potential ARARs were presented in Appendix B of the FSA. The potential ARARs were further evaluated in Section 4 of the FSA in light of Site circumstances and the selected ARARs were presented.

The ARARs were divided into three types: contaminant specific, action specific and location specific. Typically it is the contaminant specific ARARs which are germane to the development of objectives and goals. In contrast, action specific and location specific ARARs typically create constraints on the remedial alternatives. For that reason, the contaminant specific ARARs will be summarized in conjunction with the remedial action objectives and goals, while the action and location specific ARARs will be summarized, where appropriate, as part of the description of each alternative.

The selected contaminant specific groundwater ARARs for the Eagle Mine Site are presented in Table VII-A. The site-wide chemical specific ARARs are summarized in Table X-1 and the action and location specific ARARs are summarized in Table X-2 in this document.

TABLE VII-A

Contaminant Specific Ground Water ARARs at the Eagle Mine Site

CITATION

Colorado Ground Water Standards, 5CCR 1002-8, Section 3.11

SUBSTANTIVE REQUIREMENTS

Rex Flats Ground Water:

Relevant and appropriate for classification as Class 3 - Protection of Surface Water (section 3.11.4(B)(3)). See Table VII-B for the numerical values.

Old Tailings Pile Ground Water:

Relevant and appropriate for classification as Class 5 - Limited Use and Quality (section 3.11.4(B)(5)). No ARARs were identified for the Class 5 ground water.

Maloit Park North of Cross Creek Ground Water:

Relevant and appropriate for classification as Class 1 - Domestic Use Quality (section 3.11.4(B)(1)). The numerical values for the constituents of concern include:

Arsenic -	50 ug/l
Cadmium -	10 ug/l
Chromium -	50 ug/l
Lead -	50 ug/l
Mercury -	2 ug/l

Ground Water Beneath the Consolidated Tailings Pile:

Relevant and appropriate for classification as Class 4 Potentially Usable Quality (section 3.11.4(B)(4)).

Arsenic -	50 ug/l
Cadmium -	10 ug/l
Chromium -	50 ug/l
Lead -	50 ug/l
Mercury -	2 ug/l

Ground Water Adjacent to the Eagle River:

Relevant and appropriate as Class 3 - Protection of Surface Water (section 2.11.4(B)(3)). See Table VII-B for the numerical values.

The different source areas of the Site contain a variety of groundwater regimes with potentially differing groundwater classifications. These areas have not been formally classified by the State of Colorado, and for that reason EPA evaluated the characteristics of the groundwater regime, evaluated the Colorado requirements and independently determined the substantive import of those Colorado requirements.

The EPA considered surface water quality ARARs and a variety of other to-be-considered (TBC) information when framing the remedial action objectives and goals. These TBCs included both the water quality criteria developed by the Colorado Division of Wildlife (DOW) and the water quality goals established in the Remedial Action Plan (RAP) and adopted by reference in the Consent Decree.

The Colorado Table Value Standards (TVSs), as the relevant and appropriate criteria at the Site, are adopted as the surface water quality Final Remediation Goals. There are several reasons for this selection:

First, the statutory language of CERCLA specifically includes the Federal Water Quality Criteria (FWQC) in the universe of ARARs where those criteria are relevant and appropriate. For zinc, the Colorado TVSs are equivalent to the FWQC, and for other metal constituents the Colorado TVSs have been established using the FWQC protocol.

Second, the CWQD classification for Segment 5 of the Eagle River and the segments immediately upstream and downstream of the Eagle Mine Site are all Class 1, cold water aquatic life. EPA concurs that the designated Class 1 cold water aquatic life use for Segment 5 is appropriate and that it reflects an attainable condition. The CWQD classification of Segment 5 has been approved by EPA as being consistent with the requirements of the Clean Water Act.

Third, the TVSs for the metals of concern are applicable immediately upstream and downstream of the Eagle Mine Site. Segment specific water quality standards are allowed pursuant to the Colorado regulations; however current Segment 5 numeric water quality samples for metals reflect the existing, degraded condition of the water resource. A number of the current numeric standards were based on an expression of the "ambient," degraded water quality at that time. Those numeric standards do not fulfill the goal function and are, obviously, not appropriate as remediation targets; i.e., the existing numeric standards for Segment 5 reflect the existing degradation that is the subject of the CERCLA action. EPA believes the Final Remediation Goals should serve as a target for ongoing and proposed remediation not a historic reflection of a degraded condition.

Fourth, the TVS were promulgated as part of the Colorado basic standards for surface water. The TVS values were selected for promulgation because they have been determined by the State and approved by EPA as those values which would fully protect the designated Class 1 aquatic life use. Consistent with the classification of Segment 5 as a Class 1, cold water aquatic life, the EPA believes that the Eagle River surface waters "are intended to become suitable for such uses" as prescribed by Section 3.1.13(1)(c)(i), and that the TVSs are relevant and appropriate to those uses. (Also see 3.1.16 (1) and 3.1.7 (1)(b)(i)). This conclusion is inherently consistent with the structure of the Colorado regulations, until such time that the Commission formally redefines the nature of the aquatic community being protected and the numeric standards required to protect that redefined aquatic community. The selected contaminant specific surface water ARARs for the Site are presented in Table VII-B.

TABLE VII-B
Contaminant Specific Surface Water ARARs
at the Eagle Mine Site

CITATION

Colorado Water Quality Standards, 5CCR 1002-8, Section 3.1.7, Table III, Table Value Standards, (TVS).

SUBSTANTIVE REQUIREMENTS

Standards apply on a year-round basis.[1] Hardness is assumed to be 100 mg/l.[2] Standards are not to be exceeded more than once every three years on average.[3] The relevant and appropriate chronic surface water standards for contaminants of concern include:

Zinc	106 ug/l (dissolved)[4]
Cadmium	1.1 ug/l (dissolved)[4]
Copper	12 ug/l (dissolved)[4]
Lead	4.0 ug/l (dissolved)[4]
Silver	0.08 ug/l (dissolved)[5]

The relevant and appropriate acute surface water standards for contaminants of concern include:

Zinc	117 ug/l (dissolved)[6]
Cadmium	3.9 ug/l (dissolved)[7]
Copper	18 ug/l (dissolved)[6]
Lead	96 ug/l (dissolved)[6]
Silver	2.0 ug/l (dissolved)[6]

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- 1 The standards apply on a year-round basis. (See Section 3.1.9(1)).
 - 2 Hardness is assumed to be 100 mg/l. A final determination of the Site-specific numerical ARAR values for each of the listed metals will require application of Footnote (2) to Table III of the Basic Standards. (See Footnote (2) to Table III of the Basic Standards and Methodologies for Surface Waters, 5 CCR 1002-8, Section 3.1.16).
 - 3 Standards are not to be exceeded more than once every three years on average. (See Footnote (4) to Table III of the Basic Standards and Methodologies for Surface Waters, 5 CCR 1002-8, Section 3.1.16).
 - 4 Chronic Table Value Standards. A chronic standard is that level not to be exceeded by the concentration for either a single representative sample or calculated as an average of all samples collected during 30-day period. (See Section 3.1.5 (7)). Also note that the chronic standard is implemented in combination with a selected duration and frequency of recurrence. (Id).
 - 5 The chronic Table Value Standard for silver employs the Table Value Standard specific to trout. Otherwise the conditions outlined in footnote 4, above, apply.
 - 6 Acute Table value Standards. An acute standard is that level not to be exceeded by the concentration in a single sample or calculated as an average of all samples collected during a one-day period. (See Section 3.1.5 (2)). Also note that the acute standard is implemented in combination with a selected duration and frequency of recurrence. (Id).
 - 7 The acute Table Value Standard for cadmium employs the Table Value Standard specific to trout. Otherwise the conditions outlined in footnote 6, above, apply.

Eagle Mine Remedial Action Objectives and Goals

The general remedial action objectives, and where applicable, the numerical goals for the Eagle Mine Site are presented in Table VII-C.

TABLE VII-C
General Remedial Action Objectives and Final Numerical Remedial
Action Goals for the Eagle Mine Site

General Remedial Action Objectives		Final Remedial Action Goals	
Improve the quality of water in the Eagle River to support Class 1 aquatic life use;		Chronic	Acute
	Zinc	106 ug/l[1]	106 ug/l[5]
	Cadmium	1.1 ug/l[1]	1.1 ug/l[5]
	Copper	12 ug/l[1]	12 ug/l[5]
	Lead	4 ug/l[1]	4.0 ug/l[5]
	Silver	0.08 ug/l[1]	0.08 ug/l[5]
Control or eliminate human ingestion of contaminated ground water;	Arsenic	50 ug/l[2]	
	Cadmium	10 ug/l[2]	
	Chromium	50 ug/l[2]	
	Lead	50 ug/l[2]	
	Mercury	2 ug/l[2]	
Control or eliminate exposure to airborne contaminants;	Total Suspended		
	Particulates		135 ug/m3[3]
	Lead		1.5 ug/m[3]
Control or eliminate exposure to contaminants in soil;	Lead		1000 mg/kg[4]
Ensure the long term integrity of structures and facilities associated with remedial activities at the Site.			

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- 1 Chronic Colorado TVSSs as the relevant and appropriate standards. Dissolved concentrations. If the classification for Segment 5 of the Eagle River is changed or the CWQSSs are updated to reflect the results of the remediation, those new standards could be adopted as the final remedial action goal at the five-year review.
 - 2 Identification of specified ground water areas, classifications, and goals based upon the Colorado Ground Water Standards. The goals presented here are ARAR for Class 1, Domestic Use-Quality ground water. For the Class 3, Surface Water Protection ground waters the goals for surface water quality apply.
 - 3 Based on CTP construction air permit conditions as To Be Considered criteria. Concentration in air over a 24-hour period.
 - 4 Based upon Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites, (September 1989). Surface soils > 1000 mg/kg are removed. Surface soils > 500 mg/kg but < 1000 mg/kg are treated with lime.
 - 5 Acute Colorado TVSSs as relevant and appropriate standards. Dissolved concentrations. If the classification for Segment 5 of the Eagle River is changed or the CWQSSs are updated to reflect the results of the remediation, those new standards could be adopted as the final remedial action goal at the five-year review.

B. Description of Alternatives

The goals in developing the remedial alternatives were to provide a range of clean up options with sufficient detail to adequately compare alternatives. The alternatives developed for the seven sources of contamination are as follows:

Eagle Mine Seepage

The remedial action objective specific to this source of contamination is to: reduce the transport of metals in both surface and subsurface mine seepage so that Final Remediation Goals will be achieved in the Eagle River. Four remedial action alternatives were defined:

I. NO ADDED ACTION

The mine workings have been flooded to reduce the formation of acid and thereby reduce the generation of contaminated water into the Eagle River. There is limited evidence, although no clear trend, that this "passive treatment" approach is working. A substantial portion of the surface seepage from the mine is being collected and treated. However, the uncollected seepage, mostly in the colluvial area of Rock Creek, is the major source of metals loading to the river. At the present the time, the Final Remediation Goals are not being attained in the Eagle River.

II. EXTRACT/COLLECT/TREAT/MONITORING

Alternative II is the same as Alternative I but adds: the collection of the colluvial seep water in Rock Creek using extraction wells; pumping to the existing collection system; conveyance to the water treatment plant; water treatment; and continued monitoring. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

III. SUBSURFACE/SURFACE COLLECTION/TREATMENT/MONITORING

In this alternative, two gravel-filled trenches with perforated pipe along the southern side of Rock Creek will collect subsurface seeps emanating from the hillside beneath the mine. Existing prominent surface seeps would be collected in three-foot diameter vertical collection pipes, (bermed on the upstream end of the drainage to preclude entrance of surface water except in large storm events). Each trench discharges to the existing seepage collection box near the confluence with the Eagle River, where seepage would be pumped to the treatment plant. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

IV. SUBSURFACE/SURFACE COLLECTION/TREATMENT/CLEAN WATER DIVERSION/MONITORING

This alternative includes Alternative III and adds the diversion of surface flow in Rock Creek upstream of the impacted area. This addition minimizes the volume of clean water contaminated by subsurface flow from the mine works. The diversion of the creek will be evaluated under the Fish and Wildlife Coordination Act to determine if impacts will require mitigation measures. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

Table VII-D illustrates each alternative for this source area.

Waste Rock Piles/Belden Non-Point Sources

The remedial action objective specific to this source of contamination is to: reduce the transport of metals by infiltration and surface water runoff so that the Final Remediation Goals will be achieved in the Eagle River. Four remedial action alternatives were defined:

I. NO ADDED ACTION

There are twelve waste rock piles on the cliff faces between Gilman and the Eagle River. These piles, which came from mining activity, cover approximately 93 acres but their exact thickness is unknown. To prevent surface water run-on, clean-water diversion ditches have been constructed upslope of 11 of the piles.

II. MONITORING OF SURFACE/GROUNDWATER FROM EACH WASTE SOURCE

This alternative includes the installation of a series of monitoring wells near the toe of the waste rock piles plus automatic storm sampling stations at appropriate drainage locations. Sampling and testing of the groundwater and surface water would be conducted on a regular basis to determine the amount of metals loading attributable to the waste rock piles.

III. PARTIAL REMOVAL OF WASTE ROCK PILES WITH ONSITE DISPOSAL

This alternative consists of removing and disposing of all the waste rock piles that are located between the base of the lower cliffs and the railbed through Belden. This option would include recontouring underlying sediments, limited backfilling and revegetation of lower slopes. Waste rock would be placed at the current location of the historic pond in a reconfigured CTP.

IV. TOTAL REMOVAL OF WASTE ROCK PILES

This alternative consists of removing and disposing of all the waste rock piles that are located on the Site between the Eagle River and U.S. Highway 24 and disposing them at the reconfigured CTP. This would include some recontouring and revegetation.

Table VII-E illustrates each alternative for this source area.

Roaster Piles

The remedial action objectives specific to this source of contamination are to: 1) reduce the surface water transport of metals from the area of Roaster Pile 1 and associated drainage so that Final Remediation Goals will be achieved in the Eagle River, and 2) re-establish vegetation to a natural condition. Four remedial action alternatives were defined:

I. NO ADDED ACTION

This alternative leaves the remains of the roaster piles in their existing conditions with the prospect that the revegetation efforts previously attempted will be successful in controlling the levels of metals discharged to the Eagle River via surface water runoff. This alternative also includes regular monitoring of quality of surface water in the drainage to determine the effectiveness of the revegetation efforts.

II. COLLECT/TREAT/MONITOR

This alternative includes: the construction of a small collection structure (intake dam) at the base of the drainage; the construction of a small diameter pipeline to collect and convey the 20 gpm base flow to the existing collection system near Belden with subsequent delivery of the contaminated water to the water treatment plant. Monitoring of water quality in the drainage is included to determine whether water quality improves. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

III. LIME TREAT/TOPSOIL/REVEGETATE SURFACE

This alternative consists of lime treatment of the existing soil, covering the roaster pile areas with approximately 12 inches of imported topsoil and revegetating the areas. Monitoring of the water quality in the drainage will also be required to test the effectiveness of the topsoiling and revegetation.

IV. COLLECT/TREAT/MONITOR-LIME TREAT/TOPSOIL/REVEGETATE

This alternative combines the collection, treatment and monitoring outlined in Alternative II with the lime treatment, topsoiling and revegetation of Alternative III.

Table VII-F illustrates each alternative for this source area.

Rex Flats/Old Tailings Pile Areas

The remedial action objective specific to these areas is to: reduce the surface and ground water transport of metals so that the Final Remediation Goals will be achieved in the Eagle River.

Two remedial action alternatives were defined:

I. NO ADDED ACTION/USE RESTRICTIONS

The state has overseen the removal of the tailings material from these two areas. This waste material is now in the CTP, although residual tailings and metals in soils remain. This action has been largely successful, however there is some concern over spring runoff from snowmelt from both areas and the success of revegetation in the south end of the Rex Flats area. Restrictions on well drilling, deed restrictions and zoning will be used to control ground water development in both areas. Monitoring will be continued to determine whether additional measures (i.e., additional soil removal and contaminated water collection and treatment) are needed.

II. USE RESTRICTIONS/ALTERNATE WATER SUPPLY/STORM WATER SAMPLING

This alternative prohibits installation of drinking water wells and, if necessary, requires a domestic water supply for future residents and recreational users. The source of domestic water supply could come from the Town of Minturn's 110,000 gallon water tank which is located on a bluff south of the Middle School.

Table VII-G illustrates both remedial action alternatives for this source area.

Consolidated Tailings Pile

The remedial action objectives specific to this source of contamination are to: 1) reduce the surface and groundwater transport of metals so that the Final Remediation Goals will be achieved in the Eagle River; 2) to control potential human ingestion of ground water contaminated by metals from the consolidated tailings pile; 3) control potential exposure pathway to mine tailings; and 4) control exposure to airborne contaminants. Four remedial action alternatives were defined:

I. NO ADDED ACTION - CAP ALL BUT HISTORIC POND

The RAP provided for elimination of the historic pond on top of the CTP. Reducing this hydraulic gradient would decrease the leaching and transport of metals within the pile to ground water. In addition, the pile was to be completely capped to reduce infiltration of rain and snow melt through the tailings. The CTP is now 40% capped. Currently, the wet sludge (6-8% solids) from the WTP is being placed in the historic pond located on the CTP. This alternative assumes that the wet sludges will continue to be disposed in the historic pond. It also assumes that the historic pond will not be drained and the cap will not be completed, because water treatment sludge will be generated indefinitely, and because no option has been identified for sludge disposal. The disposal of the slurry-like, wet sludges is subject to, and does not satisfy the prohibition on the land disposal of liquids as ARAR. Also, the potential for airborne transport of metals may not be completely addressed. (See the water plant treatment discussion.) The no-added action does not attain the ARARs requiring continued collection of leachate and continued run-on and run-off control. This alternative also assumes the Town of Minturn will withdraw ground water from the current wells at current rates.

II. COMPLETE CAPPING/USE RESTRICTIONS/NEW WATER SUPPLY

This alternative provides: draining the historic pond; completion of low permeability cap; dewatering of water treatment sludge and disposal in lined cell at the CTP, prohibiting ground

water use in the historic waste management unit zone of influence by zoning, deed restrictions and well permit prohibitions; and relocation of the Minturn Town well outside of the historic waste management unit zone of influence. By providing an option for long-term management of dewatered water treatment sludges this alternative would allow the cap to be completed, and would eliminate the land disposal of liquids. This alternative would not attain the ARAR requiring leachate collection or containment. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs and goals.

III. EXTRACTION FROM EXISTING TRENCHES/TREATMENT/NEW UPGRADIENT DIVERSION TRENCH

This alternative includes the components outlined in Alternative II, and adds two elements. First, extraction of ground water from the two collection trenches located at the toe of the CTP would continue until it can be demonstrated that surface water quality goals can be attained without such ground water extraction. The contaminated water would be treated at the WTP. Second, a reconstructed trench would be added to divert up-gradient clean ground water away from the CTP. The trench will convey the uncontaminated ground water to Maloit Park wetland to help maintain the water level. An additional deep monitoring well south of Cross Creek would be added to determine the effect of contaminant reduction in the deep aquifer. This alternative would not attain the RCRA ARAR requiring effective leachate collection or containment due to the inadequate size of the existing trenches. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs and goals. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

IV. SLURRY WALL/EXTRACT/TREAT

This alternative includes the components outlined in Alternative II and encircling the consolidated tailings pile with a slurry wall from the ground extending from the surface to bedrock. The completed slurry wall would divert most ground water from entering under the tailings pile, and also minimize water under the tailings pile from moving downgradient. Ground water extraction from within the bounds of the slurry wall would be required with this alternative. This alternative would satisfy the RCRA capping requirements and mandate for leachate collection or containment. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs and goals. Management of the water treatment plant sludges is discussed as part of the description of the water treatment plant.

Table VII-H illustrates each remedial action alternative for this source area.

Maloit Park Wetlands

The remedial action objectives specific to this source of contamination is to: prevent direct contact exposures to tailings or contaminated sediments in the Maloit Park Wetlands and to re-establish vegetation to a more natural self-sustaining condition. Two alternatives were defined:

I. NO ADDED ACTION/REMOVE VISIBLY CONTAMINATED SOILS

This alternative includes removing only the visibly contaminated soil from an area of approximately 7 acres to a depth of 12 inches and disposing of the material in the CTP. Revegetation would occur in the substrate. This alternative could allow the oxidation of residual metals and the release of those metals by surface water infiltration for transport to the Eagle River.

II. REMOVE VISIBLY CONTAMINATED SOILS/REPLACE WITH IMPORTED FILL AND TOPSOIL/REVEGETATE

This alternative includes excavating the surface soil to a depth of 12 inches from the approximately 7 acres and to a depth of 24 inches from an area of approximately 2.6 acres within that 7 acres. The contaminated material would be disposed of in the CTP. Fill would be imported and placed within six inches of final grade. Fill would be placed almost immediately after removal to prevent oxidation and release of residual metals in soils. Then six inches of top soil would be placed over the entire area. Finally, wetlands type vegetation would be

planted over the entire area. This alternative would mitigate wetlands impacts.

Table VII-I illustrates each alternative for this source area.

Water Treatment Plant

The following section analyses the most promising alternatives for continued treatment of contaminated water at the WTP and management of WTP sludges. The objective of the water treatment plant operations is to: provide adequate capacity and treatment performance until such time that water treatment is no longer required to consistently achieve the Final Remediation Goals in the Eagle River.

I. NO ADDED ACTION/TREATMENT UNTIL WATER QUALITY GOALS ARE MET/SLUDGE DISPOSAL IN CTP HISTORIC POND

This alternative consists of continuing the current water treatment operations until the Eagle River water quality criteria are met. Under the current scenario, sludge will continue to be pumped into the historic pond at the CTP. The disposal of wet sludges do not satisfy the RCRA prohibition on the land disposal of liquids. This alternative does not allow completion of the cap.

II. CONTINUED WATER TREATMENT UNTIL WATER QUALITY GOALS ARE MET/DEWATER AND DISPOSE OF SLUDGE AT CTP

This alternative includes dewatering of the sludge and its placement in an onsite cell. The dewatering process would decrease the sludge volume substantially. The sludge would be placed on the CTP in a lined cell. At closure, the lined cell would be capped. This alternative also provides for construction of a system to convey any incident storm water collected in the cell to the WTP. The discharge from the water treatment plant is subject to NPDES permitting and ultimately must meet water quality ARARs and goals.

If the water treatment sludges are disposed on top of the CTP, the historic pond must be eliminated and infiltration control must be implemented that is equivalent to the level of control that would be provided by a completed RAP cap. Similarly, if additional water storage is required after the historic pond is eliminated, a lined pond may be constructed on top of the CTP only if the CTP cap is complete or some equivalent method of infiltration control has been implemented.

III. CONTINUE WATER TREATMENT UNTIL WATER QUALITY GOALS ARE MET/DEWATER SLUDGE/DISPOSE OF SLUDGE OFFSITE AT AN EXISTING FACILITY

This alternative is the same as Alternative II, but substitutes the disposal of dewatered sludge at an approved off-site disposal location. The nearest facility of this type is near Bennett, Colorado, in the eastern part of the state. The facility is subject to RCRA Subtitle D and must hold a county Certification of Designation.

IV. CONTINUE WATER TREATMENT UNTIL WATER QUALITY GOALS ARE MET/DEWATER SLUDGE/DISPOSE OF SLUDGE IN CONSTRUCTED DISPOSAL CELL IN EAGLE COUNTY

This alternative is the same as Alternative III, but includes the construction of a sludge disposal facility in Eagle County. The proposed facility would be subject to State permitting requirements and receipt of an Eagle County Certificate of Designation.

V. CONSTRUCT ARTIFICIAL WETLAND FOR WATER TREATMENT/DISPOSE OF CONTAMINATED SUBSTRATE IN CTP

This alternative includes the construction of an artificial wetland to treat all collected water, preparation of a disposal cell in the CTP for contaminated substrate, and the disposal of the contaminated substrate in the CTP. The wetlands would remain in operation as a treatment facility until such time as water quality in the Eagle River has met the specified criteria.

Table VII-J illustrates each alternative for this source area.

VIII. COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Eagle Mine Seepage

Overall Protection of Human Health and the Environment

This criterion assesses the protection provided by each alternative to human health and the environment. Overall protection focuses on the level of protection provided by each alternative, and how Site risks will be eliminated, reduced or controlled through treatment, engineering or institutional controls.

Alternative IV is most protective of human health and the environment. Alternative IV consists of a toe drain along the south side of Rock Creek to intercept surface and subsurface seepage and a system to convey the collected seepage by pipeline to the WTP. The alternative includes the construction of a culvert system to divert Rock Creek surface flow from a collection point above the elevation of the mine pool to an existing culvert which drains into the Eagle River. This will isolate clean surface water from contaminants in the colluvium in the lower part of Rock Creek and will minimize the amount of water collected in the toe drain.

The principal environmental impact from this source is contaminated seepage entering the Eagle River at concentrations toxic to aquatic life. Alternative IV controls those impacts to the Eagle River by effectively reducing the amount of contaminated seepage that is released to the river. Treatment of the contaminated water collected in the trenches will occur at the WTP.

Alternative III provides equivalent protectiveness to Alternative IV but will require treatment of a larger volume of diluted, contaminated water.

Alternative II is less protective than Alternative III or IV because, as proposed: the extraction wells are less efficient at collecting the colluvial water than an interceptor trench; the current surface seep collection ditches are exposed and subject to continual degradation from rock slides and storm events; and the current ditches do not extend far enough upgradient to collect all the surface seeps. It is possible to enhance Alternative II to achieve protectiveness comparable to Alternative IV. The enhancements required for comparable protectiveness would include: additional extraction wells combined with containment of the colluvial water to ensure effective collection of subsurface seepage from the colluvium; collection of additional upgradient seeps or demonstration that lowering of the mine water level eliminates the upgradient seeps; and enclosing the system which collects the surface seeps.

Alternative I - No added action, is not considered adequately protective of the environment. Water quality data for the Site indicates that this area, despite the existing seepage collection, remains a major source of contaminant release to the Eagle River.

There are no unacceptable short-term or cross-media impacts associated with any of the Alternatives except Alternative I. Both the toe drain and extraction well field can be constructed without causing added release of metal contaminants to the Eagle River.

ARARs

None of the alternatives will serve to attain surface water quality ARARs and goals independently. It is only through combined actions at all of the source areas that the final remediation goals will be achieved. Alternatives IV and Alternative II, if enhanced, would be equivalent in their contribution towards ARARs attainment. Alternative I and II (as proposed) and III do not extract and thus prevent as large a mass of contamination from reaching the Eagle River as Alternative IV.

Long-Term Effectiveness and Permanence

None of the alternatives would provide a permanent solution, however Alternative IV will be effective until such time as the seepage from the mine has improved in quality so that treatment is no longer required. Alternative IV is longer term and requires less maintenance than Alternative I, is more effective and as permanent as Alternative II, and is more effective and as permanent as Alternative III.

Reduction of Toxicity, Mobility or Volume

Alternative IV reduces the volume and mobility of the contaminants to a greater degree than Alternative III, II and I. The clean water diversion provided in Alternative IV will prevent cross contamination of clean surface water and minimize the volume of water requiring treatment.

Short-Term Effectiveness

Alternative IV provides short term effectiveness that is equal to or greater than the other alternatives. Implementability Alternative IV is somewhat more difficult to implement than Alternatives I and II due to the difficulty of excavation. However, the toe drain is believed to be more effective in collecting the seep water than the existing collection system and/or the proposed extraction wells. The implementability of Alternative IV is similar to that of Alternative II and will reduce the volume of water requiring treatment.

Costs

Present value cost for Alternative IV is \$263,000, compared to \$192,000 for Alternative III, \$107,000 for Alternative II, and \$125,000 for Alternative I.

B. Waste Rock Piles/Belden Non-Point Sources

Overall Protection of Human Health and the Environment

Because the contaminant release from potential sources in the Belden area is not adequately characterized, it is difficult to evaluate the relative protectiveness of remedial alternatives. Theoretically, Alternative IV, total removal, should provide the greatest protectiveness. Removal of all waste rock could reduce this source of metal contamination thereby reducing the risk to aquatic receptors in the Eagle River. After Alternative IV, Alternative III would provide the most protection by removing a substantial portion of the source of metal contamination. Alternative II does not provide protection of the environment because it does not include activities which will reduce transport of metals into the Eagle River; it does however, provide the basis for assessing future actions. Alternative I, No Added Action, does not provide adequate protection of the environment.

It is probable that unacceptable short term impacts would be associated with Alternatives III and IV. It may not be possible to prevent an increase in transport of metals to the river during removal due to the steep, unstable configuration of the piles and the very limited work area available along the river. Exposed surfaces left after removal could produce a dramatic increase in excess metals due to infiltration of snowmelt or by surface flow during storm events. It is possible that transport of metals by storm events could be a long-term result of large removal actions at this location.

ARARs

Without additional data, the applicability or relevance and appropriateness of the stormwater regulations are not certain. The proposed monitoring will allow that potential ARAR to be fully developed. If it is determined that the stormwater regulations apply, EPA would evaluate whether an Explanation of Significant Differences (ESD) would be necessary.

Long-Term Effectiveness and Performance

Currently, there is no reliable evidence that any of the alternatives would be effective for long-term reduction of metals loading to the Eagle River. Total removal could provide some reduction in long-term loading, but the magnitude of that reduction is unknown.

Reduction of Toxicity, Mobility or Volume

Alternative II will not provide a reduction in toxicity, mobility or volume of the contaminants. Alternatives III and IV may reduce mobility below the current levels. The extent of reduction by any of the alternatives cannot be estimated.

Short-Term Effectiveness

Alternative II provides greater short-term effectiveness than Alternatives III and IV and is equivalent to Alternative I. Alternatives III and IV are unlikely to be effective in the short term due to short-term degradation of surface water quality in the Eagle River. Significant degradation will result from the disturbance of the waste rock required for removal. A long period of time may be required for the river to recover from that impact.

Implementability

Alternative II is much easier to implement than Alternatives III and IV and slightly more difficult than Alternative I. Alternative III would be difficult to implement and Alternative IV would be the most difficult given the location and amount of earthwork that must be performed. Depending upon the configuration of the natural ground surface underlying the waste rock it may not be possible to totally remove all of the waste rock.

Costs

Present value cost for Alternative II is \$186,000 compared to no added cost for Alternative I, \$9.4 million for Alternative III and \$28.3 million for Alternative IV.

C. Roaster Piles

Overall Protection of Human Health and the Environment

Alternative IV is the most protective alternative developed for this source area. Expedited revegetation combined with collection and treatment provides the greatest reduction in metals transport. Alternative III provides application of lime and covering the area with topsoil. Topsoil will expedite revegetation, reduce infiltration and reduce acid formation by minimizing the oxygen level in metals laden sediments. Alternative II provides some protectiveness by preventing contaminated surface water from the Roaster Pile area from entering the Eagle River. Alternative III is more protective than Alternative I but less protective than Alternative II. Alternative I, No Added Action, may not be protective of the environment.

ARARs

Alternatives III and IV will both contribute to attaining ARARs by controlling stormwater. Alternative III will accomplish this by preventing contact with contaminated materials. Alternative IV also accomplishes this and provides added progress towards achieving the surface water quality goals by collecting the seepage.

Long-Term Effectiveness and Permanence

Alternative III will have long term effectiveness by reducing contaminant transport on a permanent basis. Alternative IV includes the activities of Alternative III so it would be equally effective. The added water collection and treatment component of Alternative IV does not increase the long term effectiveness or permanence. Alternatives I and II may not be effective in the long-term and may not lead to a permanent reduction in metals loading to the Eagle River.

Reduction of Toxicity, Mobility or Volume

Alternative III will be more effective in reducing the mobility of the contaminants than alternatives I and II. Implementation of alternatives II or IV would result in a greater reduction of volume and toxicity of the contaminants delivered to the Eagle River.

Short-Term Effectiveness

Alternative II and IV would be the most effective in the short term because collection of the discharge can be quickly linked to the existing pipeline in Belden. Alternative IV will also be more effective in the short-term than the No Added action.

Implementability

Alternative III will be very difficult to implement given 1) access to the area with a need to transport topsoil via railroad, 2) the extreme slope of the drainage and 3) the boulders located in the drainage. Alternative I is implementable as it requires no remedial activities. Alternative II is implementable and Alternative IV would be comparable to Alternative III to implement.

Costs

Present value cost for Alternative III is \$239,000. This is compared to \$66,900 for Alternative I, \$63,000 for Alternative II and \$272,000 for Alternative IV.

D. Rex Flats/Old Tailings Pile Areas

Overall Protection of Human Health and the Environment

Alternative II will provide better overall protection of human health and the environment than Alternative I by requiring an alternate water supply if future development of the areas occur. Prohibiting ground water withdrawals will provide protection of human health until such time that the natural attenuation of metals in the groundwater occurs.

ARARs

Attainment of ARARs in the Rex Flats groundwater is based upon meeting the surface water quality ARARs in the Eagle River. None of the alternatives will serve to attain surface water quality ARARs and goals independently. It is only through combined actions at all of the source areas that the remediation goals will be achieved. Due to the interconnection between the Eagle River and the Rex Flats groundwater, improvements in Eagle River surface water quality will promote attainment of the contaminant specific groundwater ARARs at Rex Flats. At the OTP, the groundwater is of limited use and quality. As a Class V groundwater area, ARARs for the OTP were not identified.

Long-Term Effectiveness and Permanence

The long-term effectiveness of both alternatives is dependent upon the success of local government at limiting the use of the ground water in the area. However, Alternative II provides some increased effectiveness by anticipating the demand for water through provision of an alternate water supply to the Site.

Reduction of Toxicity, Mobility or Volume

Neither alternative will reduce the toxicity, mobility or volume of the contaminants. The alternate water supply element of Alternative II does further ensure that the restrictions on ground water development will be effective.

Short-Term Effectiveness

Alternative II will be somewhat less effective in the short term than Alternative I, as it requires the installation of a pipeline and appurtenances.

Implementability

The Alternative II will be slightly more difficult to implement than Alternative I.

Costs

Present value cost for Alternative II is \$284,000 compared to \$15,400 for Alternative I.

E. Consolidated Tailings Pile

Overall Protectiveness of Human Health and the Environment

Alternatives III and IV are equivalent in protecting human health and the environment. Under Alternative III, human health will be protected by moving the Minturn municipal water wells. The environment will be protected by: completion of the cap; sludge dewatering; continued pumping of the extraction trenches to reduce contaminant transport to the Eagle River; and the installation of upgradient diversion trenches to reduce transport of metals by groundwater. Alternative IV places a slurry wall around the CTP and pumps groundwater from the interior to create a barrier to further reduce transport of metals by groundwater. With Alternative IV it will be difficult to guarantee placement of a gap-free slurry wall due to variable subsurface conditions. Less protection of the environment is provided by Alternative II because continued extraction of contaminated ground water from the trenches is not included. Alternative I is the least protective. Continued disposal of wet sludge at the pond will maintain the hydraulic gradient that is leaching metals from the CTP and transporting them to groundwater. Alternative I will not provide protection to human health or the environment.

ARARs

The Colorado Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities, (6 CCR 1007-3 Part 264, Subpart N) Landfill standards were determined to be relevant and appropriate to the CTP because the tailings materials are sufficiently similar to hazardous wastes to warrant imposition. The Subpart N, Landfill standards require construction of an impermeable cap and continued leachate containment or collection. Only Alternative IV satisfies both of these requirements. Alternative III will only satisfy the leachate collection requirement if the trenches are enhanced to improve their performance.

Long-Term Effectiveness and Permanence

Alternative III would provide greater long-term effectiveness and permanence than Alternatives I and II and would be approximately equivalent to Alternative IV in these aspects.

Reduction of Toxicity, Mobility or Volume

Alternative III will be equivalent to Alternative IV in reducing the mobility (by extraction) and toxicity (by treatment) of the groundwater. Alternative II would provide only limited amount of mobility and volume reduction. Alternative I would not sufficiently reduce mobility and volume.

Short-Term Effectiveness

Alternative III provides short-term effectiveness that is greater than Alternative IV, II and I. By immediately collecting leachate, eliminating the historic pond and diverting upgradient groundwater, Alternative III would reduce metals loading to the Eagle River to a larger degree and more quickly than the other alternatives.

Implementability

Alternative III would be more easily implemented than Alternative IV, approximately equivalent to implementing Alternative II, and slightly more difficult to implement than Alternative I.

Costs

Present value cost for Alternative II are \$606,000 compared to \$679,000 for Alternative III and \$12.92 million for Alternative IV. Costs for Alternative I have not been estimated, but should be considerably less than those of the other alternatives.

F. Maloit Park Wetlands

Overall Protection of Human Health and the Environment

Alternative II provides overall protection to human health and the environment by removing the contaminated soil, disposing the contaminated soil at the CTP and replacing the removed soil with uncontaminated material. Under Alternative I the environment may not be protected as metals in sediments below the surface may be oxidized and released to groundwater and surface water. Similarly, Alternative I is not protective of human health as the potential for direct contact exposure to contaminated tailing and sediments remains.

ARARs

Both alternatives provide for disposal of the tailings in the CTP. Either Alternative III or IV presented for the Consolidated Tailings Pile will attain RCRA ARARs and contribute to attainment of ARARs and goals in the Eagle River.

Long-Term Effectiveness and Permanence

Alternative II will provide for greater long term effectiveness and permanence than Alternative I due to a greater probability of providing effective vegetation. If significant tailings materials are left in the wetland at the completion of Alternative I, metals transport into the Eagle River by surface runoff and shallow groundwater and direct contact exposure risks will continue.

Reduction of Toxicity, Mobility or Volume

Alternative II would be more effective in the reduction of the mobility of the contaminants than Alternative I by more quickly re-establishing a reducing environment and eliminating direct contact exposure.

Short-Term Effectiveness

Alternative II will be more effective in the short term than Alternative I by covering and quickly creating a reducing environment and eliminating direct contact exposures.

Implementability

Alternative II and Alternative I are equally implementable.

Costs

Present value costs for Alternative II are \$450,000 compared to \$172,000 for Alternative I.

G. Water Treatment Plant

Overall Protection of Human Health and the Environment

Alternative II is protective of human health and the environment. Dewatering of the sludge and onsite disposal in a properly designed cell will prevent the migration of metals and allow completion of the cap. Alternative III is roughly equivalent in protectiveness; because sludge will be removed entirely from the Site, there may be some risk from increased truck traffic in the area. Alternative IV is similar in protectiveness to Alternative III, assuming that a suitable offsite disposal cell location can be found in Eagle County. Alternative V may not be as protective as III and IV because contaminated wetland substrate may contain leachable metals at toxic levels. Alternative I is not protective; continued disposal of liquid sludge at CTP will continue to cause infiltration and maintain the release of contaminated groundwater from CTP.

ARARs

Continued operation of the water treatment plant pursuant to the existing permit will contribute to attainment of the TVS as ARAR in the Eagle River. CPDES permits are renewed once every five

years. The sludge is not characteristic and is not listed and therefore, is not hazardous waste. During the renewal process, EPA may recommend that the permit limits be adjusted to reflect the Colorado TVS, because these standards are the surface water quality ARARs and Final Remediation goals at the Site. Alternative II, III and IV all attain ARARs. Alternative I does not attain ARARs as the Colorado Regulations Pertaining to Solid Wastes Disposal Sites and Facilities prohibits the disposal of liquids in landfills. The ARARs affecting treatment in an artificial wetland have not been evaluated.

Long-Term Effectiveness and Permanence

None of the alternatives can be considered as a permanent solution although each would be effective if continued until Eagle Mine seepage and CTP leachate reach a quality and quantity protective of the environment.

Reduction of Toxicity, Mobility or Volume

Alternative I, II, III and IV will reduce the mobility of the contaminants by treatment and disposal. A undesirable side effect of Alternative I is the maintenance of the hydraulic drive which leaches contaminants from the tailings disposed at the CTP. If demonstrated, Alternative V would reduce the mobility by sequestering the contaminants in the substrate.

Short-Term Effectiveness

Alternative II is approximately equivalent in short-term effectiveness to Alternatives III and IV. Alternative I is not effective in the short-term as closure of the historic pond and elimination of the hydraulic drive are not accomplished. Alternative V would be somewhat more effective than Alternative III or IV in the short term.

Implementability

Alternative II will be easier to implement than Alternatives III and IV, approximately as implementable as Alternative V, and slightly more difficult to implement than Alternative I.

Costs

Present value costs for Alternative II are \$15.58 million, compared to \$7.72 million for Alternative I, \$21.75 million for Alternative III, \$16.21 million for alternative IV and a very speculative estimate of \$1.94 million for Alternative V.

IX. SELECTED REMEDY

The selected remedy for cleanup of the Eagle Mine Site is comprised of one alternative for each of the seven areas of the Site that EPA has found are contributing metals loading to the Eagle River or have been evaluated for public health concerns. The following are the selected remedies for each area determined by EPA to meet selection criteria.

Eagle Mine Seepage/Rock Creek

The environmental impact from this area results from surface and subsurface contaminated mine seepage entering the Eagle River. The contaminated mine seepage is toxic to aquatic life. The selected remedy for this source area, Alternative IV, controls impacts to the Eagle River by minimizing the amount of contaminated seepage which is allowed to reach the river. In addition to continued flooding of the mine workings, Alternative IV employs a toe drain as the process option to intercept surface and subsurface seepage and dewater the drainage. Monitoring of the seep volume and quality will continue and data will be collected to verify that the toe drain is effectively collecting subsurface seepage. The contaminated water collected by the system will be conveyed by pipeline to the WTP for treatment.

The selected remedy includes an inlet and culvert system to divert uncontaminated Rock Creek surface flow from upstream of the impacted area, around the collection system, to an existing culvert which drains into the Eagle River. Diverting the uncontaminated Rock Creek flows will reduce transport of contaminants to the Eagle River.

Treatment of the contaminated water, followed by sludge dewatering and disposal in a lined cell at the CTP will reduce the mobility of the contamination and prevent release of the metals contamination to the environment.

The present value of the selected alternative is \$263,300, with a capital cost of \$127,950, and an annual O&M cost of \$17,530.

EPA has determined that an enhanced version of Alternative II, may provide comparable performance and equivalent protectiveness to the toe drain. Instead of a toe drain, this alternative utilizes a well field for extraction of subsurface seepage. The well field would operate in conjunction with subsurface containment, diversion of uncontaminated Rock Creek surface water and, if effective, mine drawdown to reduce seepage. This enhanced version of Alternative II would require a 90% reduction of the colluvial flow along Rock Creek and would be implemented in two phases: Phase I would consist of installation of a limited number of extraction wells and conducting a mine drawdown test lasting one full year. (Phase I actions are currently underway, wells were installed in the summer of 1992 and the mine drawdown was started in September, 1992, pursuant to an agreement between CDH and Paramount.) If these actions do not result in a 90% reduction in colluvial flow, then Phase II would be executed. In Phase II, more extraction wells would be added in conjunction with a subsurface cutoff wall containment structure to retain subsurface seepage for extraction and transfer to the WTP. This cutoff wall would be installed at a geologically favorable location along Rock Creek where bedrock is near the surface and forms a "slot" in the canyon. A channel was blasted in the bedrock underlying the "slot" to install the existing culvert which diverts the lower segment of Rock Creek. Also in Phase II, if the mine drawdown has not improved the quality of the surface water in Rock Creek, then an upgradient diversion will be installed to convey uncontaminated surface water to the existing culvert. All these actions will be completed within 2 construction seasons of the signing of this ROD (that is by November, 1994).

EPA will evaluate the enhanced extraction well process option as part of Remedial Design. The present value of the enhanced extraction well process option is \$241,100, with a capital cost of \$104,161, and an annual O&M cost of \$17,225.

Waste Rock Piles/Belden Non-Point Sources

At the present time, EPA does not believe that removal of the waste rock piles can be justified. There is insufficient data to evaluate how these areas impact the Eagle River and it is suspected that other non-point sources exist in the vicinity. Removal of the piles would cause significant, negative short-term impacts to Eagle River water quality. Removal of the waste rock piles would be extremely expensive given the safety concerns associated with large scale earthmoving in the confines of a narrow, steep canyon.

EPA does believe that a better understanding of the potential impacts from the Waste Rock Piles is crucial to understanding Segment 5 of the Eagle River and its potential for supporting aquatic life. Without additional information on the loading, the transport, and the seasonal characteristics of the Waste Rock non-point sources, the proposed biological studies cannot accomplish their objectives.

For these reasons, EPA has determined that the proper course of action is to delineate the surface and sub-surface contributions of the waste rock piles to the metals loading in the Eagle River. As the result, Alternative II was chosen as the selected remedy for the waste rock pile source areas.

Alternative II consists of installation of a series of monitoring wells near the toe of the waste rock piles at Belden, plus automatic storm sampling stations at appropriate drainage locations. In addition, leach tests will be performed on a cross section of the varied mine waste materials which comprise the waste rock piles to determine metals availability for transport to the Eagle River. This alternative will provide valuable data necessary to determine the amount of contamination released and the mechanisms by which the contamination is transported to the Eagle River. Until these mechanisms are understood, it is not possible to develop remediation strategies which avoid the negative environmental impacts associated with the wholesale removal of waste rock from the canyon. Because residual contamination will remain in the waste rock piles, the data collected through implementation of Alternative II will be evaluated as part of the 5-year review.

The selected remedy for this source area does not reduce the transport of metals to the Eagle River, but it does provide a basis for assessing future actions. Likewise, the selected remedy will not provide a reduction in toxicity, mobility or volume of contaminants. The present value for the selected alternative is \$186,000 with a capital cost of \$86,225 and an annual O&M cost of \$12,920.

Roaster Pile Area

EPA has selected a modified version of Alternative I for this area. It consists of expedited revegetation and direct monitoring of seepage from the hillside below Roaster Pile 1 area. EPA believes that revegetation is the most cost effective and implementable alternative to control the loading from the roaster area drainage. The appropriateness of this approach is directly related to the limited (2-3%) metals loading contributed by the Roaster Pile area to the Eagle River. The revegetation will serve to control erosion of remnant Roaster Pile materials and to cut the infiltration of rain and snow-melt through these remnant materials. As a part of this remedy, seepage which emanates from the area of Roaster Pile 1 will be monitored directly, on at least an annual basis, to determine the extent of loading reduction which occurs.

In contrast to the Alternative III presented in the Proposed Plan, EPA has determined that the addition of 12" of topsoil will be difficult or impossible to implement and may not provide significantly better reduction of metals transport than the approach developed in the RAP. Liberal application of lime or other soil amendments in areas where revegetation is unsuccessful or marginally successful can be used to further promote rapid revegetation. EPA does not believe that allowing 9 years to elapse before evaluating the revegetation effectiveness as provided in the RAP is reasonable. EPA will require, as a component of the selected remedy, continued monitoring and a five year review of the revegetation program. At that time, if successful revegetation has not been achieved, additional lime application, seeding and topsoiling may be required.

The present value for the selected alternative is \$91,200 with a capital cost of \$24,313 and 10 year O&M cost of \$66,888.

Rex Flats/OTP

The EPA believes that, with one exception, the current approach prescribed by the RAP at the OTP and Rex Flats, is appropriate and satisfies the evaluation criteria. The single exception is the need to ensure expedited revegetation and to clearly provide a mechanism to require additional revegetation if successful revegetation is not accomplished within five years. For that reason, EPA has selected Alternative II. Alternative II also requires for an alternate water supply if future development of the area occurs. It should be noted that extensive monitoring will continue to be conducted in these areas.

The present value for the selected alternative is \$284,000 with a capital cost of \$265,000 and an annual O&M cost of \$2,430. The capital cost of \$265,000 may or may not be incurred depending upon future land use decisions for the area.

Consolidated Tailings Pile

EPA has selected Alternative III for the CTP. Alternative III consists of the following actions. The CTP cap must be completed within 2 construction seasons after the signing of this ROD and the historic pond must be permanently drained and capped within one construction season so that the continued infiltration and associated mobilization of metals is reduced or eliminated. Effective extraction and treatment of leachate/ground water is also required to attain ARARs, and must be continued until the CTP no longer contributes to violation of the Final Remediation Goals established for the Eagle River. Enhancement of the existing extraction trenches and the installation of monitoring wells will be required to ensure the effectiveness of the trenches. These enhancements include extending the north extraction trench to intercept seepage which is currently entering Maloit Park Wetland, and adding piezometers at both trenches to provide better assessment of the extraction trenches performance. The enhancement of the trench will also improve the overall performance of the CTP as a land disposal unit.

Finally, diversion of clean ground water away from the CTP will serve to reduce the volume of leachate/groundwater requiring treatment and aid the dewatering of the CTP. The selected

alternative, Alternative III, also includes relocation of the Minturn wells (this action is currently underway per an agreement between the Town of Minturn and Paramount). Relocating the Minturn wells combined with groundwater use restrictions provides the highest confidence that human health will be protected and further degradation of groundwater will be prevented. Overall, the selected alternative is the most protective of the Eagle River and of public health. It is implementable and more cost effective than a slurry wall.

The present value for the selected alternative is \$679,000 with a capital cost of \$649,000 and an annual O&M cost of \$5,000.

Water Treatment Plant

A refinement of Alternative II was chosen for the Water Treatment Plant. Alternative II employs the existing Water Treatment Plant with the addition of sludge dewatering and disposal. The existing water treatment plant attains ARARs by meeting the Colorado Pollutant Discharge System permit limits. When the permit is renewed, the EPA may recommend that the permit limits require attainment of the Colorado TVS as ARAR for Eagle River water quality. The EPA recommendations will be based on information developed by extended water quality and biological monitoring at the site. EPA will issue these recommendations at the 5 year review.

Sludge dewatering is required to satisfy the RCRA prohibition on the disposal of liquids in landfills. The dewatered sludge is not a hazardous waste and will be disposed of in a lined cell at the completely capped CTP. The cell liner will serve as a means of controlling and managing incident stormwater in the cell to prevent infiltration into the CTP. Incident stormwater will be conveyed from the cell to WTP for treatment. In addition, the sludge disposal must be accomplished in a manner which prevents the windborne transport of the dried sludge. Continued air monitoring will be conducted to verify that windborne transport does not exceed State and Federal air quality standards. This monitoring may be discontinued if no windborne transport occurs due to disposal of sludge. This alternative is the most cost effective and protective. The refinement of Alternative II includes a reduced estimate of the volume of dewatered sludge, reduced estimated cost for sludge stabilization and a modified type of storage cell.

The present value for the selected alternative is \$13,609,000 with a capital cost of \$2,704,875 and an annual O&M of \$1,403,000.

Maloit Park Wetland

Alternative II was chosen as the remedy for the Maloit Park Wetlands. This alternative provides overall protection to human health and the environment by removing the tailings, containing them at the CTP and replacing them with uncontaminated topsoil material. Furthermore, the selected alternative will provide greater long term effectiveness because of the higher probability of rapid and successful revegetation. As noted above, EPA has determined that the enhancement of the north extraction trench is necessary for the successful remediation of the Maloit Park Wetland. Unless the trench is enhanced, recontamination of the wetlands will continue.

The present value for the selected alternative is \$449,600 with a capital cost of \$339,300 and an annual O&M of \$17,000.

Biological Monitoring Plan (BMP)

Based on comments received from the public and the PRP and on further internal review by EPA, EPA has determined that it is appropriate to continue a rigorous sampling program to track progress of the cleanup and to support the work of the Biological Criteria approach at the Site. The BMP will ensure that universe of data may be integrated into a package that will aid the understanding of both the long-term potential, and the limits of Segment 5 of the Eagle River to support an aquatic community. The BMP will serve to evaluate the monitoring specified in the ROD for each source area to ensure that it is adequate to assess the performance of the source-specific remedies and that the source-specific data may be effectively integrated to track progress towards compliance of the Final Remediation Goals in the Eagle River.

EPA's plan for Eagle River biological and chemical monitoring will include surface water quality analyses, surface water flow measurements, sediment analyses, surface water toxicity testing, and assessments of the aquatic community including periphyton, macroinvertebrates and fish.

Water quality sampling will be conducted at monthly to quarterly intervals at a sufficient number of Eagle River and tributary stations to determine water quality trends due to remedial actions. Storm event-based sampling will also be conducted in the Eagle River to determine the impact of storms on water quality in the Eagle River. Flow will be measured concurrent with water quality sampling so that loading due to the various Site sources and storm events can be determined.

Fish shocking will be conducted on an annual basis in the spring at the same areas used for macroinvertebrate and periphyton evaluation. The relative abundance of game fish, game fish species, size, and age categories will be determined. In addition, non-game indicator species will be assessed. Water quality sampling will be conducted concurrently with the fish shocking.

The costs for the BMP are uncertain due to pending discussions on the number of sampling stations, specific parameters to be assessed, and decisions on when sufficient data has been collected. The maximum present value cost for this alternative is \$1,772,000 with a capital cost of \$80,000 and annual sampling and analytical costs of \$390,000. These costs are based on monitoring for a five year period.

Inspection and Maintenance Plan

In response to many comments received on the Proposed Plan, EPA has determined that it is appropriate to add a comprehensive inspection and maintenance plan which will define the approach to verification of the long-term integrity of structures and facilities at the Site. Although operation and maintenance of the remedy implemented for each of the source areas is noted as a component of the selected remedy for that area, EPA believes that a comprehensive maintenance plan for the Site will help ensure the protectiveness of these remedial actions. The comprehensive maintenance plan will clarify the ongoing maintenance responsibilities for each area and will include contingency planning and emergency preparedness evaluations.

Schedules and procedures for inspection of waste rock piles, the Rock Creek collection system, bulkheads in the mine adits, the cap on the CTP and extraction trenches at CTP will be developed. The plan will include criteria for taking corrective actions when potential problems are noted during inspections. This will include a process for notifying appropriate authorities at local municipalities, the county, the State, and EPA of noted potential problems. The plan will specify the required frequency of the necessary monitoring such as mine water level, seepage volume and evidence of structural stability of bulkheads, and stability of the waste rock piles and will set forth procedures for resolving failures such as pump failures, power outages or structural failures. The inspection and maintenance plan will set forth contingency actions required for each key facility at the Site. The plan will be submitted to EPA for approval within six months of the signing of this ROD. It will be implemented immediately upon EPA approval.

The present value cost for this alternative is \$40,300 which represents an annual cost of \$2,300 for 30 years. There are no capital costs associated with this alternative.

COSTS

Costs for the selected remedy are shown in Table IX-1.

TABLE IX-1

ESTIMATED COSTS OF SELECTED REMEDY

EAGLE MINE SEEPAGE (TOE DRAIN/DIVERSION)

Capital Costs		
Toe Drain/Diversion System		\$102,360
Contingency @ 25%		\$25,590
		\$127,950
Operation and Maintenance		
Inspect/Monitor/Maintain	(Annual)	\$17,530
		\$17,530

EAGLE MINE SEEPAGE TD/DIV SUBTOTAL (NPV a 5%, 10 YEARS) \$263,300

EAGLE MINE SEEPAGE (EXTRACTION WELL ALT.)

Capital Costs		
Extraction Well Field		\$38,330
Cutoff Wall		\$45,000
Contingency @ 25%		\$20,833
		\$104,163
Operation and Maintenance		
Inspection/Power/Maintenance		\$11,565
Sample/Analyze		\$5,660
		\$17,225

EAGLE MINE SEEPAGE (EXTRACTION WELL ALT.) SUBTOTAL
\$241,100 (NPV @ 5%, 10 YEARS)

ROASTER PILE SURFACE WATER

Capital Costs		
Lime/revegetation		\$19,450
Contingency @ 25%		\$4,863
		\$24,313
Operation and Maintenance		
Maintain revegetation (5 yrs, NPV)		\$37,042
Inspect/Sample (10 yrs, NPV)		\$29,846
		\$66,888

ROASTER PILE SUBTOTAL (NPV @ 5%, 10 YRS) \$91,200

WASTE ROCK PILES/BELDEN NON-POINT SOURCES

Capital Costs		
Install wells/Samplers		\$68,980
Contingency @ 25%		\$17,245
		\$86,225
Operation and Maintenance		
Sample/Analyze (Annual)		\$12,920
		\$12,920

WASTE ROCK SUBTOTAL (NPV @ 5%, 10 YEARS) \$186,000

REX FLATS/OTP AREAS

Capital Costs	
Install water supply	\$212,000
Contingency @ 25%	\$53,000
	\$265,000
Operation and Maintenance	
Sample/Analyze (Annual)	\$2,430
	\$2,430

REX FLATS/OTP SUBTOTAL (NPV a 5%, 10 YEARS) \$284,000

CONSOLIDATED TAILINGS PILE

Capital Costs	
Diversion Trench	\$7,500
Relocate Minturn Well	\$22,500
Install Monitoring Well	\$10,000
Complete Pile Cap	\$472,800
Extraction Trench/Piezometers	\$6,800
Contingency @ 25%	\$129,900
	\$649,500
Operation and Maintenance	
Monitoring/Analysis (Annual)	\$3,000
Administration/Regulation (Annual)	\$2,000
	\$5,000

CONSOLIDATED TAILINGS PILE SUBTOTAL (NPV @ 5%, 10 YRS) \$679,000

WATER TREATMENT PLANT

Capital Costs	
Sludge Dewatering System	\$500,000
Sludge Disposal Cell	\$1,663,900
Contingency @ 25%	\$540,975
	\$2,704,875
Operation and Maintenance	
Treatment	\$1,200,000
Sludge Dewatering	\$170,000
Sludge Stabilization and Disposal	\$33,000
	\$1,403,000

WATER TREATMENT PLANT SUBTOTAL (NPV @ 5%, 10 YEARS) \$13,609,000

MALOIT PARK WETLANDS

Capital Costs	
Removal/Topsoil/Revegetate	\$339,300
Contingency @ 25%	\$84,825
	\$424,125
Operation and Maintenance	
Maintenance (3 years, NPV)	\$17,030
	\$17,030

MALOIT PARK WETLANDS SUBTOTAL (NPV @ 5%, 10 YEARS) \$449,600

BIOLOGICAL MONITORING PLAN

Capital Costs	
Storm Water Samplers	\$64,000
Contingency @ 25%	\$16,000
	\$80,000
Operation and Maintenance	
Sampling and Analysis	\$390,000
	\$390,000

BIOLOGICAL MONITORING SUBTOTAL (NPV @ 5%, 5 YEARS) \$1,772,000

INSPECTION AND MAINTENANCE PLAN

Capital Costs	
Maintenance Plan Preparation	\$5,000
	\$5,000
Operation and Maintenance	
Bulkhead Inspection	\$2,300
	\$2,300

INSPECTION AND MAINTENANCE SUBTOTAL (NPV @ 5%, 30 YEARS) \$40,300

SELECTED REMEDY TOTAL \$17,374,400

X. STATUTORY DETERMINATIONS

The selected remedy satisfies the requirements of Section 121 of Superfund Amendments and Reauthorization Act of 1986 (SARA). SARA requires that Superfund remedial actions be protective of human health and the environment. SARA also mandates that the selected remedy attain applicable or relevant and appropriate environmental standards established under Federal and State environmental laws except in those circumstances where a waiver is justified. In addition, the selected remedy must be cost-effective and utilize permanent solutions and treatment technologies to the maximum extent practicable. SARA also expresses a strong preference for remedies that as their principal element employ treatment technologies that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances. The following sections describe how the selected remedy addresses these statutory provisions.

Protection of Human Health and the Environment

The selected remedy addresses protection of the principal biotic resource of the Eagle River-cold water aquatic life that has been impacted by mining activities. The remedy also provides for the rehabilitation of an existing wetland and the revegetation of the highly disturbed areas at Rex Flats, Old Tailings Pile, and the Roaster Piles. The selected remedy also addresses three major concerns related to human health, i.e., the safety of children and employees attending the Minturn Middle School; the use of Minturn's municipal water system; and potential use of area ground water polluted by mining activities. EPA risk analysis has shown that PCBs (polychlorinated biphenyls) left in the now-flooded Eagle Mine pose no significant threat to human health.

The Superfund decision-making process will address additional human health concerns as part of Operable Unit 2. OU-2 includes further efforts to define potential risk: from use of private drinking water wells in the Minturn area; from possible metal contaminated soils in the south end of Minturn and in Gilman; and from the waste rock piles.

Metals loading to the Eagle River from the mining and milling activities is very complex. Visible and subsurface mine seeps, waste rock piles, alluvial ground water, and leachate from the tailings all contribute to the metals load in the river. The metals loading changes on a seasonal basis and is probably impacted by daily storm events. The extensive monitoring accomplished to date has yielded a basic understanding of the major sources of loading, but the results of the completed and ongoing remedial actions will require continued monitoring to fully evaluate their impact.

The selected remedy protects the environmental resources of the Site by further controlling the metals loading which presently impacts the Eagle River. The mine seepage in the Rock Creek area continues to be the principal source of metals loading to the Eagle River. The selected remedy provides for continued collection of the surface mine seepage and, as additional components, will: intercept subsurface flows in the Rock Creek drainage by collecting colluvial seepage in a toe drain, and use a culvert to divert clean Rock Creek surface water directly into the Eagle River. As a process option, EPA will consider proposals to implement an enhanced extraction well process option, if it can be shown to adequately collect subsurface flows from the Rock Creek colluvium and that additional upgradient seep collection is not required following mine pool drawdown.

The contaminated leachate/groundwater originating from the CTP will be collected and treated from the enhanced extraction trenches until it can be demonstrated that such collection and treatment is not needed to continue to meet the Eagle River Final Remediation Goals. The capping of the CTP will be completed within two years and the water treatment plant sludge will be dewatered and disposed in lined disposal cells constructed at the CTP. The capping of the CTP, the dewatering of the sludge and implementation of a lined disposal cell, combined with upgradient groundwater diversion will significantly reduce the amount of water contributing to the CTP groundwater regime and ultimately to metals loading in the Eagle River.

The metals loading from the Old Tailings Pile improved as the result of tailings removal, application of lime, and topsoiling. At the Old Tailings Pile the selected remedy seeks to ensure successful revegetation. Metals loading from the Roaster Pile area will be further reduced by ensuring successful revegetation. The Rex Flats metals loading caused by snow-melt

and other storm events will also be controlled through further revegetation. Restoration of the Maloit Park wetlands will be accomplished by removing the outwashed tailings and placing them in the CTP. The action will improve the quality of the wetlands, eliminate potential exposure to tailings contaminated sediments and reduce metals loading to the Eagle River.

Human health will be protected through complete capping of the Consolidated Tailings Pile. To eliminate the potential degradation of existing groundwater quality, new Minturn drinking water wells will be installed at an upgradient location so that drawdown during heavy use cannot cause contaminants from the CTP to be drawn to wells.

Institutional controls to restrict the use of groundwater at Rex Flats, the Old Tailings Pile, and the Maloit Park areas will be pursued. Application of Eagle County zoning authority to control development of the areas where tailings have been removed will also be pursued. State regulations in conjunction with local zoning authorities will protect the integrity of the Consolidated Tailings Pile cap.

Implementation of the selected remedy will not pose any unacceptable short-term risks or cross-media impacts.

Compliance with ARARs

Under Section 121(d)(1) of CERCLA, remedial actions must attain standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate" under the circumstances of the release at the Site. The ARARs that have been selected for the Eagle Mine Site are listed in Table X-1 and Table X-2. In addition, there is another category of information that was used in the ROD decision-making process known as "To Be Considered" (TBC) guidelines. TBCs are also provided in Tables X-1 and Table X-2. TBCs represent Federal and State advisories, criteria or guidance that are not ARARs, but are useful in developing CERCLA remedies.

The major ARARs selected for clean up of the Eagle Mine Site are:

- water quality standards for the Eagle River
- groundwater quality standards
- standards regulating the disposal of water treatment sludge

EPA offers the following discussion regarding attainment of surface water quality ARARs in the Eagle River. Although EPA believes the remedy selected in this ROD will meet the in-stream ARARs, these values probably will not be met until all of the components of the remedy are finished. In all likelihood it will take many years for the results of the remedial actions to take full effect. For this reason, continued monitoring of the Site will be necessary to track the continued progress towards compliance. In addition, continued monitoring will be essential to the review and potential future modifications of the remedies so as to maximize their beneficial impact. In summary, it will not be until the full beneficial effects of the multiple remedial components are brought to bear, in concert, that surface water quality goals will be attained.

To that end, EPA, in conjunction with the State, will pursue an "Eagle River Biological Criteria Approach" to define what would comprise an acceptable range of aquatic life in Segment 5 of the Eagle River (for example, a full aquatic community, a viable self-sustaining fishery, etc.). EPA will encourage the State will invite federal trustees, Paramount, local government and the public to participate in a liaison group to discuss the issues and remain informed of studies and results. The group will not present any decisions to EPA. However, the EPA and State cannot abrogate any legal rule-making or other legal responsibilities for the final decision as to the use classification of Segment 5. In the process of determining the definition of a viable aquatic community, this approach may also participate in the development of water quality standards for segments of the Eagle River.

As stated, the Eagle River will continue to be monitored. This monitoring will include metals load monitoring, evaluation of trends and changes in the system as controls are implemented, and biological monitoring. The biological monitoring will evaluate the actual biological response of the river biota to metals loading.

Five Year Review

EPA is required to review the "protectiveness" of its clean up measures selected in a ROD at a 5-year point starting from when remedial action commenced. Throughout the ROD process on the Eagle Mine Site, EPA has stated it would consider post-ROD solutions to Site problems if they could be shown to be equally or more protective, more effective, more cost-effective, etc., than the EPA remedies selected in this ROD. Paramount is currently studying the effectiveness of the use of biological water treatment as a remediation system for mine seepage. EPA finds this system to have potential merit but the development of a biological treatment system is now only in the "prototype" state. If Paramount can show this type system meets all CERCLA evaluation criteria then EPA will consider a modification to its ROD, possibly at the 5-year review period or even at an earlier date. If EPA decides that wetlands treatment system will be implemented, EPA will advise the public by means of a document and process called an "Explanation of Significant Differences" (ESD). An ESD explains significant changes that are made to a ROD and sets up a process, including public involvement, to make these changes, if warranted.

Another significant alternative that may be addressed by Paramount in the future is an evaluation of the possibility of intercepting clean water inflow into the Eagle Mine. EPA evaluated this alternative in its Feasibility Study Addendum but did not have sufficient information to fully evaluate this as a possible component of a remedial alternative. If it can be shown that reduction of in-flow lowers the mine water level sufficiently to reduce the volume of seepage from the mine, less contaminated seepage would require treatment. This would result in a corresponding decrease in quantity of sludge requiring disposal. EPA will consider in-flow reduction alternatives on their merits and encourages Paramount to collect the necessary data to evaluate this concept.

Cost Effectiveness

To ensure that a cost effective remedy was selected, EPA sought to understand the relative contribution of the various source areas to the metals load in the Eagle River. In this way, undue emphasis on small sources with minimal contribution to metals loading could be avoided, and remedial objectives developed accordingly. Further, where alternatives provide equivalent protectiveness, the low cost alternatives were given added weight in the selection process. As a result of this approach, the selected remedy provides overall effectiveness which is proportionate to the costs, and has avoided commitment to expensive, large scale activities where the data is inconclusive.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable and Preference for Treatment as a Principal Element

In selecting the remedy for the Eagle Mine Site EPA has utilized permanent solutions and alternative treatment technologies to the maximum extent practicable. This is a challenging mandate at mine sites given the sources, the types and the distribution of the contaminants. In selecting the remedy for the Eagle Mine Site EPA identified and screened alternatives which, as a preference, include treatment as a principal element. Because of the continuous nature of the sources at the site, source control was selected over treatment. However, the remedy does include continued operation of the water treatment plant. Water treatment represents a reliable approach which contributes substantially to achieving Site goals and to some extent permanently reduces the volume and mobility of waterborne contamination from a wide variety of sources at the Site.

Additional ROD Components

Based upon the comments received on the FSA and proposed plan and further internal review by EPA specialists, EPA has determined that it is appropriate to identify two additional remedial components in the ROD for Eagle Mine Site. The first is the development of a Biological Monitoring Plan which is required to support the work of the biological criteria approach and provide evaluation of the effectiveness of remedial actions. The second is preparation of an Inspection and Maintenance Plan which addresses the need for inspection, maintenance, and emergency preparedness associated with structures and facilities related to the remedial actions at the Site.

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